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ABSTRACT

Twenty presentations delivered at a 1976 symposium on research in deafness at Gallaudet College are compiled. The following topics are among those addressed: establishing research priorities for Gallaudet College, applying instructional technology to problems in audiologic habilitation; preliminary flow analysis of Gallaudet College graduates; and the relationship of nonverbal intelligence test scores to selected characteristics of hearing impaired students. Other speakers considered such subjects as curriculum research, hearing children of deaf parents, comparative reaction and movement times in deaf and hearing male college students and longitudinal data on the vocalizations of deaf and hearing infants. (GW)

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Proceedings of the Third Gallaudet Symposium on Research in Deafness

Educational Development Research Problems

January 21, 22, 1976

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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A STRATEGY TO DEVELOP SUGGESTED RESEARCH PRIORITIES FOR GALLAUDET COLLEGE

Clarence M. Williams
Associate Dean for Research

As you may remember, this is the third in a series of three all-Gallaudet symposia which we began in June, 1975. The first symposium was on Social and Cultural Orientation Research Problems, the second was on Language and Communications Research Problems, and the third one has the general title, "Educational Development Research Problems." These general symposia topics were developed after two years of reviewing deafness research (and related) literature and constitute a second step in our strategy. The symposia have been designed to encourage participation by a large number of Gallaudet professional personnel so that as good a representation of the perceived research problems and/or questions as possible could be obtained. Over 75 individuals made presentations on, what to them, were some of the critical issues in what happens to deaf people. These presenters were from the administration, the faculty (both undergraduate and graduate), with 12 of the 27 departments represented, the Pre-College Programs, the Sign Language Programs, the Auxiliary Services, the students, and all the research units of the campus.

A third step was to develop from each symposium long lists of questions and/or research issues. Over 100 questions were derived from the first symposium, over 200 from the second, and I expect another long list from the third. A next step is to content analyze each of these lists into a small set of a few critical research issues, and the final (tentative) step is to subject these issues to careful examination and critique by Gallaudet administrators, researchers (and others), and a National Deafness Research Advisory Committee. These refined and clarified issues then can be used by Gallaudet administrators as aids in the allocation of our future resources.

What is wanted, of course, is a research strategy, in as good form as possible, which will enable us not only to improve our own campus programs over time but, also, help us contribute useful research findings and applications through our Outreach Programs and in other ways.

Some of the issues which I have found through my analyses are:

1. What are the important <u>personal</u>, <u>social</u>, and <u>learning descriptors</u> of hearing impaired children and students which educators and researchers should know and understand in order to design and develop effective and efficient learning situations for our schools, institutions, and programs?

(Each of these issues will suggest a number of related questions. For example:

How do these characteristics develop? and How can they be best studied? and evaluated?)

2. What are the important home, school, institution, and program variables which contribute most to a hearing impaired child's personal, social, and learning development? For example, what social and/or other factors at this college inhibit or promote student satisfaction with the learning opportunities offered?

3. What are the linguistic and other properties of sign languages we need to know and understand? Also, how are new signs generated and what are the bases for their possible utility?

4. What are the most effective modes of presentation (or teaching/learning) in communicating specific types of information at the different developmental stages?

5. What technologic devices or medical treatments facilitate the languaging and communicative processes among deaf people? For example, what is the impact of technologic devices on language learning and communication? Where can we look for technologic application relevant to language and communication? To which portions of the deaf population may technologic innovations be applied?

6. What are the neurophysical (and other) consequences of a language based upon visual input with minimal or no auditory input?

Obviously, there are other issues which can (and will) be derived from our data sources. The preceding ones seem to be the ones which have received the most attention so far. It is my hope that all of you will consider and discuss these issues and provide us with any suggestions you may have.

THE NEED FOR RESEARCH IN EDUCATIONAL DEVELOPMENT

by

Edward C. Merrill, Jr.
President

Research in educational development means to me the use of research as a tool to improve teaching and learning. It means making use of scientific inquiry and problem-solving to achieve the goals of schools and colleges more fully and more efficiently. At this time, I should like to explore briefly the need for research in educational development as a context for the third all-Gallaudet symposium on the Role of Research on Kendall Green.

The first expression of need is a very personal one - not personal only to me but personal to you as well. We - you and I - pass this way but once. We invest time and energy in learning and in trying to achieve all that we can. Each of us can identify teachers, classes, books, courses, or, perhaps, entire schools which were not as helpful as they could have been. What a waste of human resources! The first and most pressing need for research on educational development is to prevent the dissipation of human energy and talent. This need, expressed in a positive way, is to use research to insure a challenging intellectual environment in schools and colleges so that the individual can grow intellectually and academically. Basically, the mission of any school or college is highly personal. It is what happens to you as an individual that counts and research in educational development can make the educational experience mean more and more to individuals.

The second need for research on educational development is purely institutional. Institutions, as you know, are structures designed by people to meet the critical needs of society at large. Prisons, hospitals, churches, courts, as well as schools and colleges, are all institutions, and there are many more. The credibility of institutions depends on how well they serve specific needs in society.

Institutions that are responsible and responsive to the society which they serve must evaluate their mission and endeavor to improve their service to the public. In a college, this means that all aspects of the educational program should be re-examined periodically for at least two reasons. The needs of society change. It is quite possible, therefore, for an institution that has been very effective to continue an educational program until it becomes outmoded. Educational programs should be re-examined also in order to be sure that the resources which the institution is using are used in an efficient manner. This is what we mean when we say that a school or college should be accountable to the public. The primary means that a college has at its disposal to re-examine its mission and its performance is research in educational development.

Third, the mission of a special school, such as Gallaudet College, is challenging and difficult to discharge. By definition, a special school focuses on a problem area, a condition that cannot be served as well by regular programs. The mission of Gallaudet College is to respond to the challenge which deafness imposes on an individual to learn and to become an independent, thinking individual. The most distinctive characteristic of the Gallaudet College response to this barrier to learning is to endeavor to eliminate the problem of instructional communication. For that reason, the policy of the College is to use simultaneous, or total, communication. In this manner, the barrier of lack of communication, which so often isolates deaf persons, is eliminated. They can study in an environment in which they have free, open communication which is readily understandable. In addition, the College takes on the burden of eliminating a language deficit which very often has accumulated due to the lack of adequate communication in the past.

The point, however, is that a special school has an even greater obligation to examine its mission and how well it is discharging this mission because the school has voluntarily accepted a very specific and difficult challenge.

The manner in which a special school acts upon this challenge is through the use of tools like research, research which is focused on educational processes and their efficacy.

Fourth, Gallaudet College has an obligation to sponsor research on educational development because we are recognized as a national, and even international, institution. The College has been chartered to serve the nation, and subsequent public laws have reinforced the mandate that programs on this campus are to be shared nationally so that deaf children, young people, and adults - wherever they may be - can profit from the investment of funds, talent, and energy here regardless of where they are.

As a matter of fact, the roles of Gallaudet College, the Model Secondary School for the Deaf, and the Kendall Demonstration Elementary School in improving educational programs in other schools can and do have a great impact on the kind and quality of students which arrive on Kendall Green each year. This, perhaps, is the unsung role of Gallaudet College throughout the years. Information, ideas, concepts, and materials have flowed from Gallaudet College to residential and day school programs. Many persons have received their professional preparation here and have gone into the field to do what we hope is a still better job in preparing young deaf people for further education and for life. The point here is that research on educational development on Kendall Green can and will have a double effect. It will not only improve the educational opportunities of students here, but it will also flow to the field where it will improve educational opportunities there.

Finally, Gallaudet College has an obligation to sponsor research on educational development for the best of all reasons -- the Board of Fellows has told us to do so! As you know, the Board of Fellows is an independent Board which annually examines in depth various programs, services, and conditions on Kendall Green. The Board of Fellows reports directly to the President and to the Board of Directors of Gallaudet College. The area of investigation of the Board of Fellows when it visited Kendall Green on October 28 - 20, 1974, was research. The report of the Board of Fellows on research programs here makes several observations and recommendations. For example, it states that "It is gratifying to discover that among the research efforts of the Gallaudet faculty are some dedicated to evaluating and attempting to improve Gallaudet programs and services . . ."[1]

It is interesting that in the same report the Board of Fellows recognizes the large research needs which confront the College and encourages the College to establish priorities among these. It says further, "A commitment to the investigation of some of these more urgent problems, if clearly and persuasively expressed, might help Gallaudet secure larger funding for the research effort."[2] These symposia, as you know, will assist the College to respond to this recommendation to establish priorities among the various research needs. It is my hope that some of the needs in the area of educational development will have a high priority assigned to them.

In closing, I should like to encourage broad participation in the Gallaudet College research program. A design is gradually taking shape and within this design I think we can find a sense of priorities, and it is my hope that each of you will find a very personal challenge to your own intellectual curiousity. Our faculty and professional staff have tremendous research competence, and this is a resource which should go far toward resolving some of the special problems which have persisted so long in the education of deaf people.

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1. Report of the Board of Fellows, Gallaudet College, Washington, D. C. (Nov. 1974) p. 4.
2. Ibid.

THE APPLICATION OF INSTRUCTIONAL TECHNOLOGY TO PROBLEMS IN AUDIOLOGIC HABILITATION

Henry Tobin
Audiology and Speech Department

The goal of audiologic habilitation is to help the hearing impaired individual achieve better communication. The key to better communication seems to depend on the individual's knowledge of the rules of language--not a book-learning acquaintance with rules, but rules as they are naturally developed and internalized by all of us as we are repeatedly exposed to samples of language. For the normal hearing individual, using the acoustic form of language, it is the constant exposure to speech which eventually clarifies the rules of this language. Internalized errors are eventually corrected.

For the individual with a hearing impairment, who is attempting to use the acoustic form of language, he will probably never receive auditory messages in an explicit form even when he is a "successful" hearing aid user. He may either not get enough of the auditory message, or it may come through in such a distorted fashion as to make it difficult for him ever to be sure what the rules of this communication game are.

Communication through speech, left to its own devices--that is, lacking environmental controls for extraneous noise, excessive room reverberation time, and manner of speech production--is somewhat haphazard. The rules may be the same but the listening conditions are always changing. The normal hearing individual can cope with this because he gets enough exposure to the explicit forms of auditory messages, as well as to their variants. That is, he is able to easily recognize the commonality of features, even when all the features are not clearly produced.

For the hearing impaired individual, it is often, or maybe generally, never clear as to what is being said. The message is generally being received in a low redundant fashion. If he is to play this communication game, he must be willing to make a lot of educated guesses about the message. He tries to "grasp your meaning in the rough." He sometimes succeeds but he often leaves these communication events with a feeling of uncertainty. Did he really get the message? What was I supposed to be hearing? What can I really hear?

One of the major problems for those of us trying to provide audiologic habilitation, and for those of us trying to derive some benefit from it, is the manner in which we present signals for training purposes. The clinician, or teacher, trying to present listening, or look and listen exercises to an individual, is not always consistent in how he does it, or probably more importantly, in the quantity and systematic manner of exposure.

There usually isn't enough time to present materials in a way that will make it possible for an individual to get enough exposure so that he can internalize a rule of spoken language.

Another problem we face is that the hearing impaired individual, the one person with the greatest need to know, is the least informed person about his own ability to extract information based on audition. In the therapy or teaching situation, we tend to keep him in the dark. We encourage, we try to motivate, but we don't effectively inform.

In addition, the individual's criterion for responding, his confidence level and willingness to respond, which we know is greatly involved in the overall success that an individual has in extracting information, is poorly controlled for in audiologic habilitation. The hearing impaired individual is generally unaware of how this factor is affecting his success.

Although audiologic habilitation is not solely the attempt to learn to process the speech code, this does represent a major aspect of its goal. To the extent that this aspect of audiologic habilitation can be achieved through systematic listening activities, instructional technology in this case, the use of machines for learning can be effectively used. I have been attempting to develop a programmed approach to audiologic habilitation. For this purpose, I have had a unit built with some unique features that will keep the user informed about how he is doing in information processing. The unit also utilizes feedback features that have existed on previously developed machines. The unit was developed to provide systematic opportunities for look and listen, listen alone, or look alone activities with user feedback features. As inputs the unit can accept all forms of tape recorded presentations including language master and video-tape. For the output the user can select a headset, TV monitor, loud speaker, vibrator, induction coil, or various combinations of these devices to achieve the desired degree of redundancy and the specific goals of the training program.

The features of the unit include a response panel providing up to eight alternatives, an accumulating percent correct indicator, a trial counter, confidence rating selectors, its associated four-celled decision matrix used for determining and modifying listener response criterion, and a 64-cell confusion matrix for displaying error patterns.

We want the hearing impaired individual to utilize the information from speech, as well as non-speech signals, to the greatest extent possible. We are particularly concerned about his ability to extract linguistic information from his degraded speech input. To most effectively do this the hearing impaired individual needs immediate feedback and information about his decoding capabilities and progress. It is our experience that the hearing impaired listener wants to monitor his own progress and determine how well he can or cannot do himself.

To develop a program to be used through the response device, a clinician or teacher must first select the class of materials that will be opposed. For example, we might want to work on stress, length of utterance, wave envelope patterns, intonation, manner of articulation, place of articualtion or non-linguistic sounds. We now must decide on how many items should be opposed on any one trial. We can work with as many as eight items in opposition or as few as two in a minimal pair condition. Each of the choices must be associated with a different tone so the response unit will know how to identify each event. A special keyboard with eight slightly different tones is employed for this purpose. This is all done in the preparation of the tape recorded material. The tone can be placed on the same channel as the testing or training material or on a separate channel.

If we are going to use different items for each trial, we need to assign each item to its appropriate class and number category if we are interested in the type of confusions that are made.

In presentation of materials, we follow a pre-test, training, and post-test format. In the pre-test condition, a light will come on only if the correct item is selected. The same feedback arrangement is used for the post-test condition. Several feedback arrangements can be used for training. For training, we can start with 100% feedback where the appropriate button lights up no matter which item is selected.

Another approach we find useful in training is the second best guess approach. Many times an individual is close to the right word - if it isn't this, it must be that. We can program this kind of listening experience in the following way: the word is said, the listener selects the wrong response, the word is said again, the listener gets the item right or wrong; if he gets it right, the light comes on, if he gets it wrong, no light comes on; in either case, the signal can be presented a third time with the correct response shown. We find this a useful way to determine which items sound alike to the listener.

The items that are confused are displayed on the 8 by 8 matrix on the side panel. A clinician or teacher using this information should be able to modify the audiologic habilitation program to meet the evident needs of the listener.

The step or trial counter helps the listener to know where he is in the program.

The percent correct indicator, although interesting to the user, is often a misleading value. Because of the strong psychologic element involved in responding, we have found it useful to monitor this aspect of response. To do this, we ask the listener to rate

his confidence in his response. He is asked to do this before he selects his item answer. A plus indicates confidence, a minus indicates lack of confidence. Using a response-to-response contingency we are able to generate the signal detection four-celled matrix showing HIT, MISS, FALSE ALARM, and CORRECT REJECTION. With a short period of instruction the listener can be taught to use the information in the four cells to help him modify his criterion to one that is more appropriate.

Programmed learning should quantitatively and qualitatively improve what we are doing in audiologic habilitation.

HEARING IMPAIRED SCHOOL LEAVERS

Robert M. Brenton
Doctoral Program
Gallaudet Graduate School

Office of Demographic Studies Research Associate Neil J. Murphy and Director Raymond J. Trybus reported in the April, 1975 issue of the American Annals of the Deaf on "Hearing Impaired School Leavers Data Reported to the Annual Survey of Hearing Impaired Children and Youth." The report concentrated on students who remained in the same school program in the years 1970-71 and 1971-72, and those who left school or changed programs for one reason or another. A more detailed study, based on data collected during the 1973-74 and 1974-75 school years, is currently being conducted.

Preliminary results indicate an apparent increase in inter-school mobility; the number of school leavers reported in 1974-75 was 7,048 as compared to the earlier study of 5,410 cases.

The data in the current study are being analyzed in terms of the concept of least restrictive placement. This concept states that the handicapped child should be placed educationally in a program as close to, or including, the regular classroom, as the child is able to function well. On a continuum of increasing special services to meet the student's individual needs, several models of programming have been suggested. For our purposes, the "Cascade Model" proposed by Evelyn Deno will be used.

Concerning the movement of hearing impaired students into the least restrictive placement, it can be noted that approximately 550 of the students in residential schools for the multiply handicapped and residential schools for the deaf moved "upward" into day programs, with 200 entering regular classes. An additional 800 hearing impaired students in day programs moved toward more integration with hearing students. Approximately 750 students were reported as having moved "downward," with roughly 450 of these students being transferred from full-time day classes into residential programs or day schools for the deaf. The number of students who changed schools but remained in the same type of program was approximately 500.

Graphically, we have a situation among hearing impaired students showing that approximately 50% of the transfers were upward into less restrictive placements, while 20% were lateral into another program of the same type, and 30% were downward into more restrictive programs requiring more special services.

Another aspect of school transfers that will come under consideration is the reason for program change. Are more parents

initiating program changes as "right to education" and "due process" laws become more well-known to parents of handicapped children? An indication of this possibility may be assessed as the number of parent-initiated changes is compared to the earlier study.

The present study will be developed to include comparisons with the Murphy and Trybus study and also a more complete description of mobility trends, including the following variables: age of transfer, hearing loss and etiology, additional handicapping conditions, and ethnic background.

In addition, we plan to analyze the data which we have collected on the graduates from hearing impaired programs. A cursory examination of the data indicates that of the reported 1,506 graduates, approximately 37%, or 560, went on to college. Some entered four-year colleges such as Gallaudet or NTID, or regular colleges for the hearing; others enrolled in two-year schools offering some type of associate degree, certificate, or diploma. Another 37% were reported as being employed either full-or part-time. The number of students receiving some type of vocational training or rehabilitation services was roughly 150, or 10%. Approximately 5% of the graduates were reported as unemployed.

We also plan to study dropout trends. Are fewer students dropping out of school as the number and availability of technical-vocational offerings increase?

Comparison of the previous study to the present data will provide important information as far as trends are concerned, as will a third collection of data in the 1977-78 school year and in future years as the cycle is repeated.

PERSONNEL, FACILITIES, AND SERVICES OF SPECIAL EDUCATIONAL PROGRAMS FOR HEARING IMPAIRED STUDENTS

Mariellen A. Vogel
Office of Demographic Studies

During the 1974-75 school year, 809 schools and programs offering special educational services to hearing impaired children returned a questionnaire describing the personnel, facilities, and services available. Information collected included the types of services offered.

Types of Programs

Of the 809 reporting, 69 reported to be residential schools for deaf students, 47 reported to be residential schools for multiply handicapped students, 77 reported to have day schools for deaf students, 612 reported to have day classes and services, 424 reported to have full-time special educational classes for hearing impaired students, 262 reported to have part-time special educational classes for hearing impaired students, 271 reported to have itinerant services, 193 reported to have resource rooms, and seven reported to have other types of programs.

Multiply Handicapped

Two hundred and thirty-one programs reported having multiply handicapped units with a total enrollment in these units of 3,883 students. One hundred and forty-eight programs had separate facilities for the units with a total of 589 full-time teachers and 41 part-time teachers. There were 1,984 students reported enrolled in residential schools for multiply handicapped and 2,258 enrolled in day schools for multiply handicapped, a total of 8,125 multiply handicapped students reported. There were a total of 1,108 full-time teachers, 64 part-time teachers, 572 aides, and 25 student teachers serving the multiply handicapped students, giving a ratio of 4.65 students per staff member.

Parent Training

Four hundred and forty of the 809 programs reported offering parent training programs.

The total non-multiply handicapped enrollment reported was 52,196. The total academic staff reported not serving the multiply handicapped was 9,754 giving a ratio of 5.35 students per staff member. The overall total enrollment reported was 60,321 with an academic staff of 11,498 giving a ratio of 5.25 students per staff member.

Seventy-five schools reported a total of 15,411 residential students and 4,835 day students.

Eight thousand, five hundred and twenty-eight full-time teachers and 391 part-time teachers were reported for academic programs. Of these, 171 had only a high school degree, 101 had an A.A. degree, 4,142 had a B.A. or a B.S. degree, 3,532 had an M.A. degree, 706 had an M.A. plus 30 hours, and only 22 had a Ph.D. or an Ed.D. Two thousand, eight hundred and three held CED or CEASD certification, 5,575 held state certification in deaf education, 2,809 held state certification in other areas, and 408 held no certification at all.

Five hundred and eighty programs reported a total of 1,181 principals, 449 programs reported a total of 908 head teachers.

Five hundred and fifty-six programs reported they did not offer a pre-vocational or a vocational program. One hundred and sixty-one programs reported a total of 1,152 full-time vocational teachers, 54 programs reported a total of 125 part-time vocational teachers, 56 programs reported a total of 130 vocational teacher aides, and 15 programs reported a total of 37 student teachers in their vocational or pre-vocational programs. Of the pre-vocational or vocational teachers, 19% held only a high school degree; 5%, an A.A. degree; 48% a bachelor's; 22%, a master's; 5%, a master's plus 30 hours, and less than 1% held a doctorate. One hundred and forty-nine were certified; 27, licensed, and 48 were neither. One hundred and nine programs reported a total of 147 vocational principals, and 97 programs reported a total of 185 vocational head teachers. One hundred and eighty-three programs reported offering pre-vocational programs, and 152 reported offering vocational programs. Woodworking and home economics were the most frequently offered training, followed by typing, arts and crafts, printing, food services, auto body repair, key punching, sheet metal, business administration, cosmetology, and computer programming. One hundred programs listed other types of training also. One hundred and seventy-four programs offered on the job training, 152 offered aptitude testing, and 138 programs reported alumni follow-up, for example, employment status.

One hundred and ninety-four programs reported they had no psychologist on their staffs. Two hundred and seventy-eight programs reported a total of 865 full-time psychologists, 188 programs reported a total of 221 part-time psychologists, and 195 programs reported a total of 438 psychologists as consultants. Of these, 4% held only a bachelor's degree, 29% held a master's, 38% held a master's plus 30 hours, 27% held a doctorate, and 2% held some other degree. Four hundred and eighty-five programs reported a total of 1,248 psychologists certified or licensed. Of the 194 programs which had no psychologist, 179 referred students when necessary.

One hundred and forty programs reported full-time guidance counselors, 55 reported part-time, and 43 reported consultant guidance counselors. Sixty programs reported vocational rehabilitation counselors full-time, 34 reported part-time, and 63 reported consultant vocational rehabilitation counselors.

Fifty-seven reported they had full-time deans of students, five reported part-time deans, and nine reported consultant deans of students. Sixty-four reported other counseling personnel full-time, 33 reported part-time, and 13 reported consultants in other counseling areas.

Registered Nurses: There were full-time registered nurses reported for 245 programs, part-time at 235 programs, and consultants at 104 programs.

Nurse's Aide/LPN: There were full-time nurse's aides/LPNs reported for 75 programs, part-time for 45 programs, and as consultants for 18 programs.

Ophthalmologists: There were full-time opthalmologists reported for three programs, part-time for 24 programs, and as consultants for 125 programs.

Dentists: There were full-time dentists reported for 20 programs, part-time for 59 programs, and as consultants for 83 programs.

Dental Hygienists: There were full-time dental hygienists reported for 22 programs, part-time for 28 programs, and as consultants for 36 programs.

Physical Therapists: There were full-time physical therapists reported for 64 programs, part-time for 28 programs, and as consultants for 53 programs.

ENT: There were full-time ENTs reported for six programs, part-time for 12 programs, and as consultants for 129 programs.

Otologists: There were full-time otologists reported for five programs, part-time for 18 programs, and as consultants for 127 programs.

Other Medical Staff: There were full-time other medical staff reported for 34 programs, part-time for 50 programs, and as consultants for 88 programs.

Health Examinations

Three hundred and thirty-seven programs reported that they did not give routine physical examinations to their students, 305 reported their students were routinely given annual physical examinations, and 140 programs routine student physical examinations were given other than annually. The school physician gave the

examinations at 193 programs; the family physician, for 233 programs; the school nurse, for 53 programs, and someone else for 37 programs.

Visual Examinations: Routine visual examinations were given annually to students at 509 programs, other than annually at 135 programs, and not at all at 142 programs. They were given by an ophthalmologist at 99 programs, by a school physician at 17 programs, by the school nurse at 425 programs, and by someone else at 157 programs. They were conducted at school for 570 programs, in an ophthalmologist's office for 78 programs, and somewhere else for 34 programs. Visual acuity testing was done at 538 programs, visual field testing at 229 programs, intraocular pressure tests at 54 programs, darkrocm adaptation tests at 40 programs, fundus examinations (ophthalmoscopy) at 70 programs, and other types of tests at 69 programs.

Genetic Counseling: Genetic counseling was provided by 78 programs, by a geneticist for 29 programs, by a general practitioner/internist for three programs, by a psychologist for 18 programs, and by someone else for 25 programs.

Other Services: Two hundred and sixty-one programs administered preventive medication/inoculations; 482 did not. Four hundred and sixty-five programs participated in state health screening programs, 260 did not. One hundred and forty-nine programs participated in medical research programs, 570 did not. Sex education was not provided for 418 programs. Sex education classes were provided at 340 programs, by the school nurse for 97 programs, by the physical education teacher for 94 programs, by the school physician for 10 programs, by a teacher other than physical education teacher for 202 programs, and by someone else for 39 programs. One hundred and ninety-one programs had the sexes integrated during the sex education classes, 140 programs did not.

Hearing and Speech Services

Staff: There were full-time audiologists reported for 227 programs, part-time for 114 programs, and as consultants for 184 programs. There were full-time audiometrists reported for 46 programs, part-time for 51 programs, and as consultants for 32 programs. There were full-time speech and hearing therapists/speech pathologists reported for 435 programs, part-time for 213 programs, and as consultants for 92 programs.

There were full-time other hearing and speech services staff personnel reported for 61 programs, part-time for 25 programs, and as consultants for eight programs. Three hundred and fifty-six programs had ASHA certified audiologists on their staffs, 215 programs had state certified audiologists on their staffs,

and 21 programs had audiologists on their staff who were certified in some other way.

Audiological Examinations: One hundred and forty programs had no audiometric tests administered to their students. Pure-tone tests were administered to students in 600 programs, SAT and/or SRT in 443 programs, speech discrimination tests in 456 programs and other audiometric tests in 187 programs. They were administered annually in 427 programs and other than annually in 197 programs. They were administered by the audiologist in 460 programs, by the audiometrist in 61 programs, by the school nurse in 57 programs, and by someone else in 127 programs, They were conducted in a soundproof room at school in 297 programs, at a certified clinic for 16 programs, at a speech and hearing center for 49 programs, in a mobile unit for 12 programs, at a hearing conservation center for two programs, in an otologist's office for three programs, and elsewhere for 219 programs.

The audiometric equipment was calibrated annually for 259 programs, semi-annually for 115 programs, monthly for 83 programs, and at some other interval for 73 programs.

Hearing Aids: One hundred and fifty programs did not have a "trouble shooting" procedure to check students' aids for broken cords, dead batteries, etc. Four hundred and twenty did on a daily basis; 116, weekly; 33, monthly, and 67 at some other interval. In 139 programs, the "trouble shooting" procedure was done by the audiologist, in 490 by the teacher, in 24 by the audiometrist, in 19 by the school nurse, and in 117 by someone else.

Four hundred and twenty-seven programs provided loaner aids when a student's aid was not working or was being repaired. Three hundred and forty-six programs did not.

Ten Functions: Ten questions were answered regarding functions common to school life with the person most likely to fulfill each function. As liaison between the program and local organizations and social clubs serving the deaf, the most likely was the teacher followed by the superintendent/director, the supervisor teacher, the principal, the guidance counselor, the psychologist, the school nurse, the vocational rehabilitation, counselor or houseparent, and the dean of students for one program. The most likely to work with a student on a personal problem was the teacher, followed by the guidance counselor, the psychologist, the principal, the social worker, the houseparent, and the supervisory teacher.

The most likely to work with a family of a hearing impaired child when they had questions concerning their child was the teacher followed by the principal, the supervisory teacher, the superintendent/director, the psychologist, the superintendent/director, the social worker, the guidance counselor, the dean of students, the school nurse, and the school physician.

The most likely to advise a student relative to a career choice was the teacher, followed by the guidance counselor, the vocational rehabilitation counselor, the principal, the psychologist or supervisory teacher, the social worker, and the superintendent/director.

The most likely to take case histories on entering students was the teacher, followed by the psychologist, the social worker, the supervisory teacher, the principal, the superintendent/director, the school nurse, the guidance counselor, the school physician, the vocational rehabilitation counselor, and the dean of students.

The most likely to work with a student to improve poor work habits and/or attitude was the teacher, followed by the psychologist, the guidance counselor, the principal, the supervisory teacher, the social worker, the vocational rehabilitation counselor, the superintendent/director or the houseparent, and the dean of students.

The most likely to counsel a student relative to postsecondary programs, which are available and which would be best for him/her, was the teacher followed by the guidance counselor, the vocational rehabilitation counselor, the principal, the supervisory teacher, the psychologist, the social worker, the superintendent/director, and the houseparent.

The most likely to administer achievement tests was the teacher, followed by the psychologist, the supervisory teacher, the guidance counselor, the principal, the superintendent/director, and the vocational rehabilitation counselor.

The most likely to be responsible for interpreting the results of the achievement tests was the teacher, followed by the psychologist, the principal, the guidance counselor, the superintendent/director, the vocational rehabilitation counselor, the dean of students, and the houseparent.

The most likely to be responsible for administering intelligence tests was the psychologist, followed by the teacher, the guidance counselor, the principal or supervisory teacher, the superintendent/director, and the vocational rehabilitation counselor.

Exact numbers of programs listing each type of person or each question are available upon request.

Residential Schools for the Deaf - Hearing and Speech Services

There were a total of 69 schools reported to be residential schools for the deaf.

Audiologists

Fifty-five were reported to be on the staffs of 42 schools full-time. Seventeen were reported to be on the staffs of 11 schools part-time. Eighteen were reported to be serving as consultants to 13 schools.

Audiometrists

Ten were reported to be on the staffs of nine schools full-time. Five were reported to be on the staffs of five schools part-time. Four were reported to be serving as consultants to three schools.

Speech and Hearing Therapists/Speech Pathologists

Sixty-six were reported to be on the staffs of 34 schools full-time. Eighteen were reported to be on the staffs of 10 schools part-time. Three were reported to be serving as consultants to three schools.

Other Speech and Hearing Services Staff

Seventy-eight were reported to be on the staffs of 14 schools full-time. Four were reported to be on the staffs of two schools part-time. None were serving as consultants to any schools.

Audiological Examinations

Seven schools reported that no tests were administered to their students. Puretone tests were given to students from 60 schools. SAT and/or SRT tests were given to students from 53 schools. Speech discrimination tests were given to students from 52 schools. Other tests were given to students from 29 schools. Audiometric evaluations were conducted annually at 46 schools and other than annually at 16 schools. They were administered by audiologists at 50 schools, by audiometrists at nine schools, by the school nurse at one school, and by someone else at one other school. The audiometric examinations were conducted in a soundproof room at 45 schools, at a certified clinic for one school, at a speech and hearing center for five schools, and elsewhere for nine schools. The audiometric equipment was calibrated annually at 25 schools, semi-annually at nine schools, monthly at 11 schools, and at other intervals at 15 schools.

Hearing Aids

Four schools did not have a "trouble shooting" procedure to check the students' aids for broken cords, dead batteries, etc. Forty-three schools checked students' aids daily, nine weekly, three monthly, and nine at other intervals. In 22 schools the

aids were checked by an audiologist, in 48 schools by a teacher, in seven schools by an audiometrist, and in one school by the school nurse. Fifty-seven schools supplied "loaner aids" when a student's aid was not working or was being repaired.

THE MULTI-HANDICAPPED HEARING IMPAIRED CHILD

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The history of the education of the deaf, in America, goes back to 1817, when the first institution for the education of the deaf, The American Asylum for the Deaf and Dumb in Hartford, Connecticut, was established. And it appears fitting that one of the first documented attempts to educate a Multihandicapped Hearing Impaired (MHHI) child was at that school. It is on record that in 1844, 27 years after the school was founded, teachers at the school worked with a deaf idiot (Gearheart & Litton, 1975).

Unfortunately, that bit of history is reflective of the documented progress which has been made towards educating MHHI children in America. What has happened in the 123 years since the first attempts at Hartford? Dr. Doctor sums up our progress in deaf education and gives us a charge in a statement given in 1959 at the Convention of American Instructors of the Deaf:

> The frontier in the field of deafness in the latter part of the 20th Century lies in the field of the M.H. The 19th Century saw the establishment of schools for the deaf, the beginning of teacher training on a professional basis, and the establishment of definite patterns of teaching the deaf. The first part of this century saw the establishment of electronic amplification in our schools. The problem now, as I see it, is in the area of deafness with additional handicaps (Doctor, 1959).

Looking at the historical chronology of the MHHI child it can be said that only in the last 20 years has the MHHI child received any formal recognition.

Pre-1954 - Very little information is in the literature.

1954 - Formal recognition was given to the problem of MHHI children when the Conference of Executives authorized the American Annals of the Deaf to publish a list of schools and classes for MHHI children as a separate section in the statistical issue of the Annals.

1956 - Elwood Stevens, Superintendent of the California School for the Deaf at Berkeley, presented a paper at the Conference of Executives meeting in which he defined the problems that schools for the deaf faced with the growing numbers of MHHI children and stated that schools should begin to recognize their responsibility in this field.

1957 - Conference of American Instructors of the Deaf (CAID) established a section for consideration of M.H. indi-

viduals; however, the papers presented did not really touch upon the subject of MHHI children.

1959 - Workshops held at the CAID meeting included sections concerned specifically with hearing impaired children who had additional handicapping conditions, i.e. emotionally disturbed, blind, mentally retarded, and aphasic.

1961 - The Illinois School for the Deaf established a program for MHHI children whose additional handicapping condition was other than mental retardation. The school had already set up a program for mentally retarded hearing impaired children.

1964 - The Babbidge report stated one of the major problems in the education of the deaf is the education of the MHHI child. Some schools were providing special classes, but too often on an improvised and makeshift basis. The Committee's study had been unable to discover any data which fully revealed the dimension of the problem, yet it did find indications that the problem was of sufficient significance to warrant research.

1966 - The California School for the Deaf at Riverside established a program for emotionally disturbed deaf boys. It was also the year that McCay Vernon did his doctoral dissertation on the causes and nature of learning disabilities, behavioral disorders, and physical defects in a sample of 1,468 deaf children. (Brill, 1974)

1968 - The Office of Demographic Studies at Gallaudet College did the first comprehensive study of MHHI children in the United States.

Identification and recognition of the needs of the MHHI population was a slow process. However, this is not meant to imply that nothing at all was being done. State schools and hospitals, private agencies, and some school districts and residential schools were probably providing modest services to the MHHI child, but their endeavors and the needs of this population were not brought to the profession's attention.

Who is considered a MHHI child? The problem of defining a MHHI child is extremely difficult because of the variables that are involved, which, in turn, make the incidence and prevalence rates difficult to ascertain. The definitions used in one place may differ from that used in another area.

Definitions typically reflect the current sociocultural standards of a given society, which are subject to constant change. The orientation of the person making the judgment of an additional handicapping condition must also be considered.

Is the person's orientation medical, psychological, educational, or legal? The Office of Demographic Studies (ODS) uses a generic definition of the MHHI child because of the varying backgrounds of the professionals answering their surveys. Therefore, in light of the data being presented being from ODS, their definition of the MHHI child is presented. "For the purpose of the Annual Survey, 'Additional Handicapping Condition' is defined as any physical, mental, emotional, or behavioral disorder that significantly adds to the complexity of educating a hearing impaired child" (Annual Survey, 1973).

Again, in interpreting the data presented the variables previously described must be considered, specifically, the background or orientation of the person who makes the determination of an additional handicapping condition (mild, moderate, severe) is not indicated in earlier reports but is at present. The 1973 report showed that for all additional handicapping conditions, in terms of educational significance, 14.2% were reported as severe, 33.6% moderate, and 43.4% mild. No report was given on degree of severity for 8.8% of the conditions. These are MHHI children in education programs, more severely involved children are probably institutionalized or at home.

Table A, Summary of Data on Additional Handicapping Conditions, shows that the number of students included in the survey has risen since the initial survey in 1968 and now represents approximately 80% of the hearing impaired children attending programs. While the number of students has increased, the percentage of students reported as having an additional handicapping condition has not increased significantly.

Table B is a summary of data by types of additional handicapping conditions. The prevalence of each additional condition appears to remain fairly constant over the years that the surveys were done. The most prevalent handicapping conditions are visual disorders, emotional or behavioral problems, and mental retardation. Vernon's data, relative to the five major etiologies of deafness, i.e. heredity, meningitis, rubella, prematurity, and Rh factor, show that the high percentage of visual disorders are mainly results of prematurity and rubella; mental retardation is the result of meningitis and prematurity (Vernon, 1969).

The Office of Demographic Studies, through their surveys, has identified approximately 300 programs that provide educational services to MHHI children in the United States. Several factors, all of which are interrelated, can be attributed to this tremendous growth over a relatively short period of time.

1. A shift in federal funding priorities to more severely MH children in general.

2. Litigation and judicial interpretations that make education the right of all children. The most publicized legal cases are Parents Association of Retarded Children v. The Commonwealth

TABLE A SUMMARY OF DATA ON ADDITIONAL HANDICAPPING CONDITIONS FOR SEVEN SCHOOL YEARS: UNITED STATES, 1968-75

	School Year 1968-69	1974-75
1. Total Students enrolled in participating programs	25,363	47,235
2. Number of students by number of additional handicapping conditions		
a) None	14,685	27,931
b) One or more	6,445	13,737
c) Not reported	4,233	5,517
3. % of students by number of additional handicapping conditions		
a) None	57.9	59.2
b) One or more	25.4	29.1
c) Not reported	16.7	11.7
4. % of students by number of additional handicapping conditions, omitting students for whom data not received		
a) None	69.5	67.1
b) One or more	30.5	32.9
5. Total number of handicapping conditions reported	8,871	20,809
6. Number of conditions per 100 students for whom data were reported	42.0	49.9
7. Number of students with visual defects	883*	3,558
8. % of all conditions reported as visual defects	10.0	17.1
9. Number of conditions per 100 students for whom data were reported omitting visual defects	37.8	41.4

*Reporting form asked for the reporting of "severe" visual handicaps

TABLE B: SUMMARY OF DATA BY TYPES OF ADDITIONAL HANDICAPPING CONDITIONS FOR SEVEN SCHOOL YEARS: UNITED STATES, 1968-1975

	SCHOOL YEAR					
	1972-73		1973-74		1974-75	
	Number	Percent	Number	Percent	Number	Percent
ALL TYPES	19,040	100.0	19,033	100.0	20,809	100.0
BRAIN DAMAGE	1,537	8.1	1,455	7.6	1,571	7.5
CEREBRAL PALSY	1,294	6.8	1,299	6.8	1,395	6.7
EPILEPSY	411	2.2	414	2.2	469	2.3
HEART DISORDERS	1,159	6.1	1,159	6.1	1,309	6.3
MENTAL RETARDATION	3,373	17.7	3,325	17.5	3,735	17.9
ORTHOPEDIC DISORDERS	774	4.1	797	4.2	903	4.3
PERCEPTUAL MOTOR DISORDERS	1,993	10.5	2,004	10.5	2,189	10.5
EMOTIONAL OR BEHAVIORAL PROBLEMS	3,451	18.1	3,360	17.7	3,457	16.6
VISUAL DISORDERS	3,202	16.8	3,219	16.9	3,558	17.1
ALL OTHER	1,846	9.7	2,001	10.5	2,223	10.7

of Pennsylvania and Mills v. the Board of Education District of Columbia.

3. Parental pressure through advocacy groups.

4. School districts being held responsible and accountable for the education of all children.

Since educational programs for MHHI children have come into existence so suddenly, the profession has endeavored to fill the voids that have existed so long. However, the task is a formidable one. Stewart (1971) cites several obstacles that impede the work being done with MHHI persons.

1. Vague nomenclature - the term multihandicapped is too vague and lacks the ability to communicate the problem.

2. The physical basis of the multihandicapped is described but it is not related to the sociocultural and family interaction variable.

3. The lack of implementation of behavioral modification techniques which are reported to have successful results. Stern disciplinarian approach is still taken.

4. Lack of media's materials for low verbal and low functioning deaf persons.

5. Education and rehabilitation programs for severely multihandicapped persons have gained knowledge of the problems and the needs of these people, but only minimal attempt has been made to share the information.

A sixth obstacle should be added to Stewart's list.

6. There exists a lack of trained personnel to deal successfully with the problems presented by the MHHI child. It appears that this sixth obstacle has a definite bearing on the first five. More training programs are needed to prepare individuals to work with this unique population. At the present time, only six colleges and/or universities offering teacher training programs in the area of the MH child have been identified. None of these programs' major emphasis is with the MHHI child. Gallaudet College in Washington, D.C. has had a teacher training program in the area of deafness since 1891. This past fall, a MHHI specialization was added to the teacher training program making it, to my knowledge, the first of its kind in the country. Certification in the area of the MHHI has been approved for students completing the specialization from the Conference of Executives of American Schools for the Deaf.

The graduates in the MHHI specialization will continue to receive the heavy concentration in language development which has always been offered and which is so vital in the education of all

hearing impaired children. They will receive pragmatic knowledge in the principles of diagnostic and prescriptive teaching, the use of behavioral objectives, behavioral modification techniques, a thorough understanding of the various handicapping conditions and their relationships to one another, exposure to a variety of MHHI children through aiding experiences, and clinical experiences and practice teaching in well organized and structured programs for MHHI children.

In closing, the educational future of MHHI children is considerably much brighter today than it was as few as three or four years ago in spite of the many still unmet needs. As residential schools, day schools, and other educational institutions continue to establish educational programs for this population, staffed with well-trained and qualified personnel, we will see more post-secondary and vocational training programs developing to foster the MHHI person's independence and productivity in our society.

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EDUCATIONAL DEVELOPMENT: DIETARY AWARENESS[1]

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Introduction

Food service plays one of the most important roles in the lives of students on the campus. They have become more involved in the decisions in regard to menu planning and types of service. But still, there has often been much dissent among the students. They have boycotted the services, sent letters to the managers, and a comment was printed in the Buff and Blue, (October 24, 1974 issue) suggesting that a nutrition inspection should have been made at the same time an environmental expert flunked the kitchen at Gallaudet for its lack of sanitary conditions.

Complaints of food served in the college dining halls are not unique here, but are typical of any residential institution. Although the services today are much better than they were 20 years ago through provision of "all the food you want" and the choice of two or three entrees, the students today are still unhappy.

The purpose of the small scale study was to examine whether or not the students at Gallaudet College met their minimum daily nutrient needs as established by the Recommended Dietary Allowances. While there had been some complaints of high starch and carbohydrate level diet served in the cafeteria, these are not considered in the study inasmuch as there are no established minimum daily recommended dietary levels of those nutrients. This should lie in the responsibilities of medical personnel.

Method

Thirty members and visitors at a Student Assembly meeting were invited to participate in the study. They were the student leaders representing the student body. Some of them represented the students on the Food Committee. Thus, it was a good study group in that they might appreciate the results of their expressions of need after the study was concluded.

They were given a survey form with a sample form on how to complete the form that included age, weight, and height, as well as a list of food to be served on April 3 and 4, 1975 from the menu provided by the Food Service Department. The subjects were given directions for completing the form. They were instructed to show the exact amount of each serving they ate and not to list servings they accepted but did not eat.

From the completed survey the food intakes were calculated for energy, protein, calcium, phosphorus, iron, vitamin A,

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[1]Based on a small scale study of dietary intake of Gallaudet college students, July 1975

thiamin, riboflavin, niacin and ascorbic acid according to the methods of Bowes and Church (1974) and Watt and Merrill (1973) to determine the daily nutritive intake of the individuals.

Results and Discussions

Of the 30 subjects invited to participate in the study, 18 (60 percent) responded, eight males and 10 females.

From the data, the question of "Do the boarding students meet their minimum nutritive needs established by the Recommended Dietary Allowances (RDA)" was answered through various analyses.

> . . . were devised as a 'standards' to serve as a standard for good nutrition on the basis that an individual consuming a diet that provided RDA for all nutrients would be unlikely to suffer nutritional inadequacy. RDA are estimates of 'acceptable daily nutrient intakes' in the sense that, although the needs of most individuals will be less than the RDA standard, there may be a small number who require more. (1974, p. 13)

Thus, the RDA are used as the standards for assessing the nutritional adequacy of individual diets, as minimum requirements.

Table 1 shows the mean nutritive intake, standard deviations, and the percentage of minimum requirements established by the RDA by sex.

A student t-test employing estimated standard error of the mean was used to test whether or not the mean intake exceeded the critical level of those established by the RDA. With exception of the iron intake of the females, all other nutritive needs were within the critical level or exceeded the minimum level of the RDA. According to various literature (Committee on Iron Deficiency, AMA, 1968 and Beaton, 1971), the females, due to their losses through menstruation, require a higher intake of iron than those required of males, yet, their dietary intake on iron was below the dietary allowance.

As noted, the Vitamin A is reasonably below the minimum through insufficient intake of vegetables among the males. From the survey forms, only 50% of the subjects ate vegetables on the first day of the study and 17% on the second day. According to the menu, spinach, squash, cabbage wedges, and peas were served on the first day and collard greens, corn o'brien, lima beans, and scalloped tomatoes on the second day. The Food Service management stated that most students accepted the vegetable serving on their tray; however, many of them apparently did not eat the vegetables, but let them waste. On those two days the average food waste disposed per participant at each meal was three ounces which is an equivalent to one serving of a food item. The data of the waste was obtained through

weighing the disposed food at each meal for two weeks for the purposes of developing the materials to be provided on Food Day. The waste, however, would not only be the vegetables, but other food such as beverages, bread, desserts, etc. Generally, in terms of the Recommended Dietary Allowances, they seem to meet dietary needs satisfactorily in that there was no evidence of a nutrient deficiency among the average student. Their mean daily nutrient intake was comparable with those found in other literature. Thus, it appears that students at Gallaudet do receive nutrient sufficiency.

Discussions

In spite of this sufficiency, it is evident that their taste satisfaction may not be fulfilled. As Gifft (1972) puts it:

> Complaints about food become a rewarding topic of conversation under certain conditions, . . food becomes a handy whipping boy. . . constantly gripes about food he is served. He may or may not admit to himself or a trusted friend that the food really isn't really bad. . . Food, however, is always around, can be endlessly vilified, and never fights back. Students away from home are often very vocal about the "dreadful food". Perhaps for the first time in their lives their own pet likes and dislikes are not being catered to--a painful but maturing experience; stresses connected with adjustments to a new environment are particularly acute the first year. . . he can't avoid with impunity may use the device of complaining about food as an emotional safety valve.

Thus, the gripes about food are normally part of the student life on the campus. They might not be aware of their dietary sufficiency before they meet their self sufficiency needs in accordance to Maslow's hierarchy of needs (1970) which begins with the physiological needs and is succeeded by safety, ego, and self-actualization needs. This was evident by the starvation study by Franklin et al. (1948), on the subjects who consumed 1570 calories of food per day which is semi-starvation, for six months. Their hunger affected human behavior directly, by reducing vigor, ability to cope with stress, and interests in pursuits other than those related to obtaining food. Beyond this, the men experienced changes in non-food behavior: sociability, grooming, the ability to plan and to participate in group activities, and interest in sex dropped off. For obvious reasons the students do not experience this due to lack of food satisfaction, thus descriptions of successful methods of motivating the students in their satisfaction of food need to be developed.

In an attempt to solve the problem, the College will be securing a professionally qualified nutritionist to be employed in the Student Affairs division. The responsibilities of the position include the role of liaison person between the College and

the food contractor as well as to provide counseling and instructions to students in normal or modified nutrition, and offer suggestions and information to best meet individual needs. Thus, dietary awareness among the students will be maintained and improved.

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TABLE 1
MEAN NUTRITIVE INTAKE, STANDARD DEVIATION AND PERCENTAGE OF MINIMUM REQUIREMENTS ESTABLISHED BY THE R D A

	Energy (kcal)	Protein (g)	Calcium (mg)	Phos-phorus (mg)	Iron (mg)	Vita-min A (IU)
Male						
Mean Daily Intake	2918±1355[1]	104±34*	907±739	1555±689**	12±6	3532±2584
R D A Allowance	3000	54	800	800	10	5000
Percentage of Allowance	97.3	191.7	113.3	194.4	122.1	70.6
Female						
Mean Daily Intake	2290±519	84±22*	915±346	1270±342*	10±4*	4564±3364
R D A Allowance	2100	46	800	800	18	4000
Percentage of Allowance	109.0	182.6	114.4	158.7	56.9	114.1

	Thia-min (mg)	Ribo-flavin (mg)	Niacin (mg)	Ascorbic Acid (mg)
Male				
Mean Daily Intake	1.1±0.3	1.8±0.9	20±4	141±81**
R D A Allowance	1.5	1.8	20	45
Percentage Of Allowance	72.5	100.0	100.0	312.2
Female				
Mean Daily Intake	1.0±0.5	1.8±0.5**	15±2	103±50*
R D A Allowance	1.1	1.4	14	45
Percentage of Allowance	93.6	127.0	106.9	228.0

[1]Mean ± Standard Deviation
Significant exceed critical level:
* $p < .01$
** $p < .05$

A PRELIMINARY FLOW ANALYSIS OF GALLAUDET COLLEGE GRADUATES

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The relationship, if any, between secondary education, the choice of majors at Gallaudet College, and subsequent occupational choices has not received a great deal of attention. Without the knowledge of what these relationships are, decisions that affect secondary and Gallaudet College programs must be made in a vacuum.

The objective of this paper is not to present a detailed analysis of all of the interrelations that could affect either secondary education, major choice, or occupational distribution of the Gallaudet College alumni; it is rather an attempt to begin the development of a model of these relations with the hope that the model developed here will be expanded in the future as more data becomes available. In Section I, the basic model that is being developed will be presented. The fleshing out of this model will be covered in Section II, and a summary of the model will be presented in Section III.

The basic thesis that is being developed is that a specific relation exists between the type of secondary education the students receive and their major choice at Gallaudet College and the occupational distribution of these graduates. This relation will become evident as the model begins to be developed in Section II.

I. DATA

The data for this study comes from the 1962-1972 Gallaudet College Alumni Survey, gathered during 1974. The survey obtained data on the respondent's major, school of graduation prior to entering Gallaudet College, advanced degree obtained or working on, and the respondent's occupation.

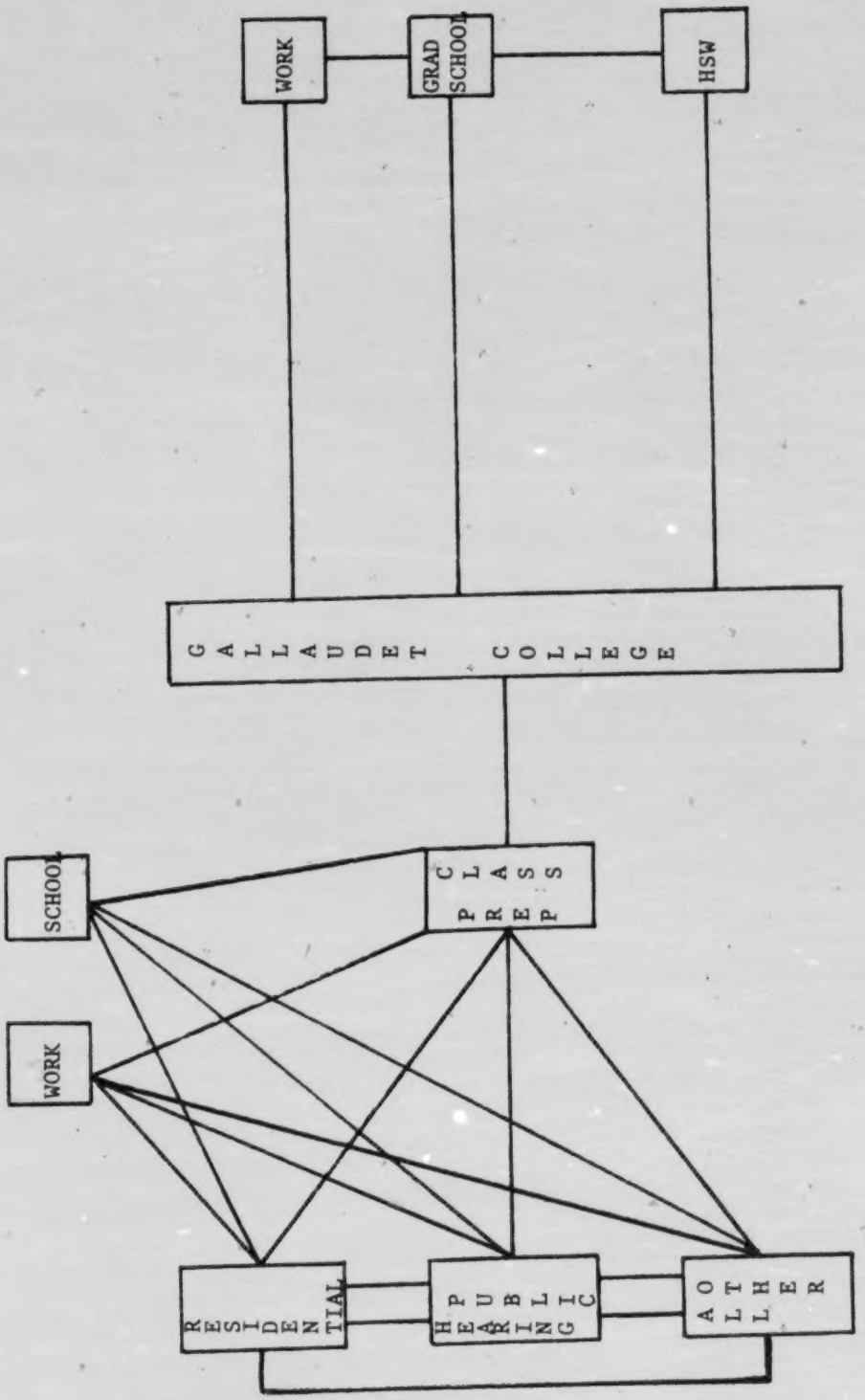
Out of a total of 984 questionnaires mailed, 584 or 59% were returned. These consisted of 49% females and 51% males. Twenty-three percent of the respondents came to Gallaudet from public schools, 60% from residential schools, while the remainder (17%) came from other programs or did not list the type of school.

II. THE MODEL

An educational system can be thought of as being composed of students, teachers, physical facilities and equipment needed to carry out the functions of the system. A model that attempts to take all of these factors into account would of necessity be micro in nature.

However, because of data limitations the model depicted below (see Chart 1) is an attempt at conceptualizing a macro educational

CHART 1


WORK
GRAD SCHOOL
HSW
GALLAUDET COLLEGE
SCHOOL
WORK
CLASSES
RESIDENTIAL
HEARING
ALTHER

model of what I shall call the Gallaudet Centered System (GCS). This model is unique in the sense that those students that entered Gallaudet College can and do come from a variety of educational backgrounds depicted on the left hand portion of the chart. These backgrounds range from public schools where the student lives at home, to residential schools where the student resides at the school for most of the year.

While it is evident that students can and do exhibit movements between the three types of pre-college programs which are classified as residential schools for the deaf, hearing public schools, and all other types of programs, this paper will focus only on the graduates of these school programs.

The chart itself shows that the graduates of these programs have the option of either entering the labor force or continuing their education beyond the secondary level. While it would be of interest to know the characteristics of those students that do not enter Gallaudet College, data in this area is not available. This paper will, therefore, focus only on the dispersion of those students that have matriculated to Gallaudet College.

After graduation, as it is depicted in the model, the Gallaudet College graduate has basically two choices (three if the graduate is female). These choices are to continue their education, to enter the labor force or, in the case of female graduates, to pursue the career of homemaker. The choice of what avenue to follow after graduation to a large extent will depend on the career choice these graduates want to pursue.

III. METHODOLOGY

The analysis of the returns proceeds along the lines of relative concentration[1] of students, by sex, in the various model sectors. The model therefore shows those areas in which the students, by type of secondary programs, are heavily concentrated. This should not be interpreted as meaning students from other programs are not found either in specific major areas at Gallaudet or in specific occupations but rather that they do not comprise a disproportionate share of either the major or occupational class.

The following approach was taken in order to arrive at some comparisons across majors at Gallaudet: 1) the respondents were arrayed by sex and reported majors; 2) a relative concentration analysis of those majors with five or more respondents was undertaken; and 3) where possible for those majors in which there were not at least five respondents the majors were reclassified along division lines (Science and Mathematics, Social Studies, Humanities, and Professional Studies) and a relative concentration analysis carried out on this basis.

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[1]Relative Concentration = Proportion of students by School of Grad by major. Proportion of students by School of Grad in response population.

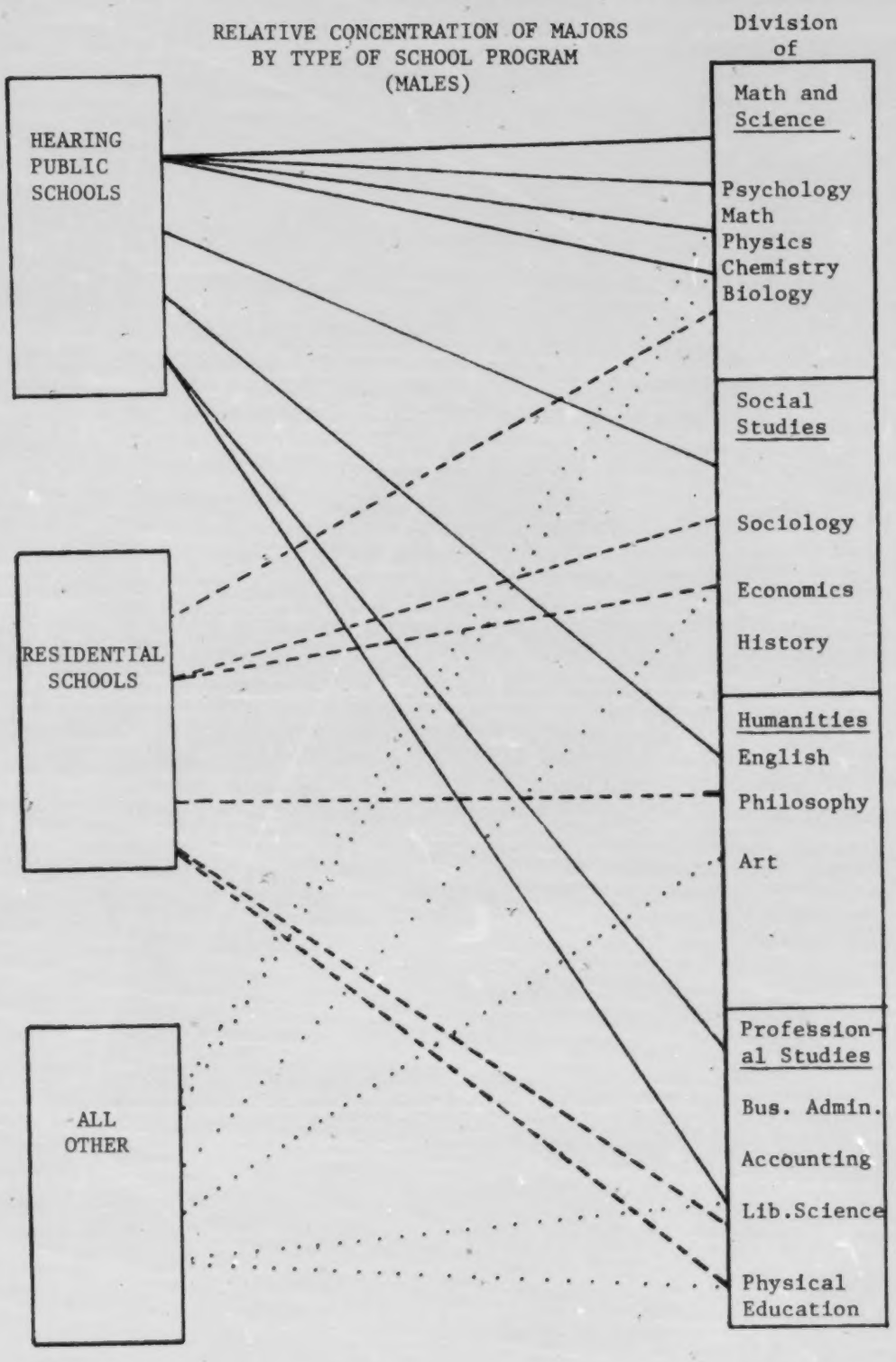
TABLE 1
MAJORS BY TYPE OF SCHOOL PROGRAM GRADUATED FROM
(MALES)

Division and Major	Hearing Public School		Relative Concentration	Residential School		Rel. Conc.	All Others*		Rel. Conc.
	No.	%		No.	%		No.	%	
Division of Science & Math									
Biology	5	20	77	16	64	110	4	16	100
Chemistry	6	27	104	11	50	86	5	23	144
Math	19	33	127	31	53	91	8	14	88
Physics	2	33	127	2	33	57	2	33	206
Psychology	5	31	119	9	56	97	2	13	81
Division of Social Studies									
Economics	2	25	96	6	75	129	-	-	
History	3	11	42	18	67	116	6	22	138
Sociology	6	32	123	11	58	100	2	10	63
Division of Humanities									
Art	2	25	96	4	50	86	2	25	156
English	8	50	192	6	38	66	2	13	81
Philosophy	1	20	77	4	80	138	-	-	
Division of Professional Studies									
Accounting	8	33	127	10	42	72	6	25	156
Business Administration	5	36	138	7	50	86	2	14	88
Library Science	1	6	23	12	71	122	4	23	144
Physical Education	4	16	62	20	80	138	1	4	25
All Others	0	-		5	63	109	3	37	231
Total	77	26		172	58		49	16	

* includes day classes, day schools, private schools, those not graduated, and those not responding to school of graduation.

CHART 2

RELATIVE CONCENTRATION OF MAJORS
BY TYPE OF SCHOOL PROGRAM
(MALES)



A similar approach was taken for the analysis of occupational distribution. Thus, occupational classifications which had at least eight respondents were individually analyzed. Those occupational classifications that did not meet this minimum criteria were grouped into the nine census of occupation categories (1-9) and analyzed on this basis.

IV. THE RESULTS

A total of 19 different majors were reported by male respondents. Out of this number only four did not have at least five respondents. Because of this small number it was not possible to regroup these four majors into any meaningful division groupings. Thus, they were grouped in an "all other" category.

Table 1 and Chart 2 present the relative concentration of male respondents by major for the 1962-1972 period. A comparison of those secondary school graduates that comprise the highest percentage of male students at Gallaudet (public schools and residential schools) reveals large differences in relative major concentrations. In general, public school graduates were concentrated in the Science and Mathematics division, as well as Accounting and Business Administration. Males who had matriculated from residential schools had a higher concentration in the Social Sciences, Library Science, and Physical Education Departments. It thus appears that for whatever reasons there was an extremely different selection of majors by the type of school program these students attended prior to their arriving at Gallaudet.

A similar differential pattern of relative major concentrations exists for the 1962-1972 female respondents. Thus, as it is seen in Table 2 and Chart 3 female public school graduates have had a high concentration in Biology, Math, Psychology and English while residential school graduates have concentrated relatively heavily in Home Economics, Library Science, and Physical Education. It should be noted that female graduates from all other programs exhibited a high major concentration in the divisions of Science and Math and Social Studies.

Thus, as in the case with male respondents, there seems to have existed a definite pattern of major choice depending upon which type of program the students graduated from. It must be pointed out that since this survey was undertaken Gallaudet has undergone changes in majors offered. These changes may result in basic shifts in relative concentrations for the graduates of the various programs.

However, given that the above pattern did exist for the 1962-1972 period, what factors can be suggested that would account for the distribution that emerged? One possible reason that readily comes to mind would be if the range of courses offered in the various types of secondary programs varied in content. Thus, if the residential school graduate feels he has not received a strong enough grounding in the Physical Sciences, he may avoid them as a

TABLE 2

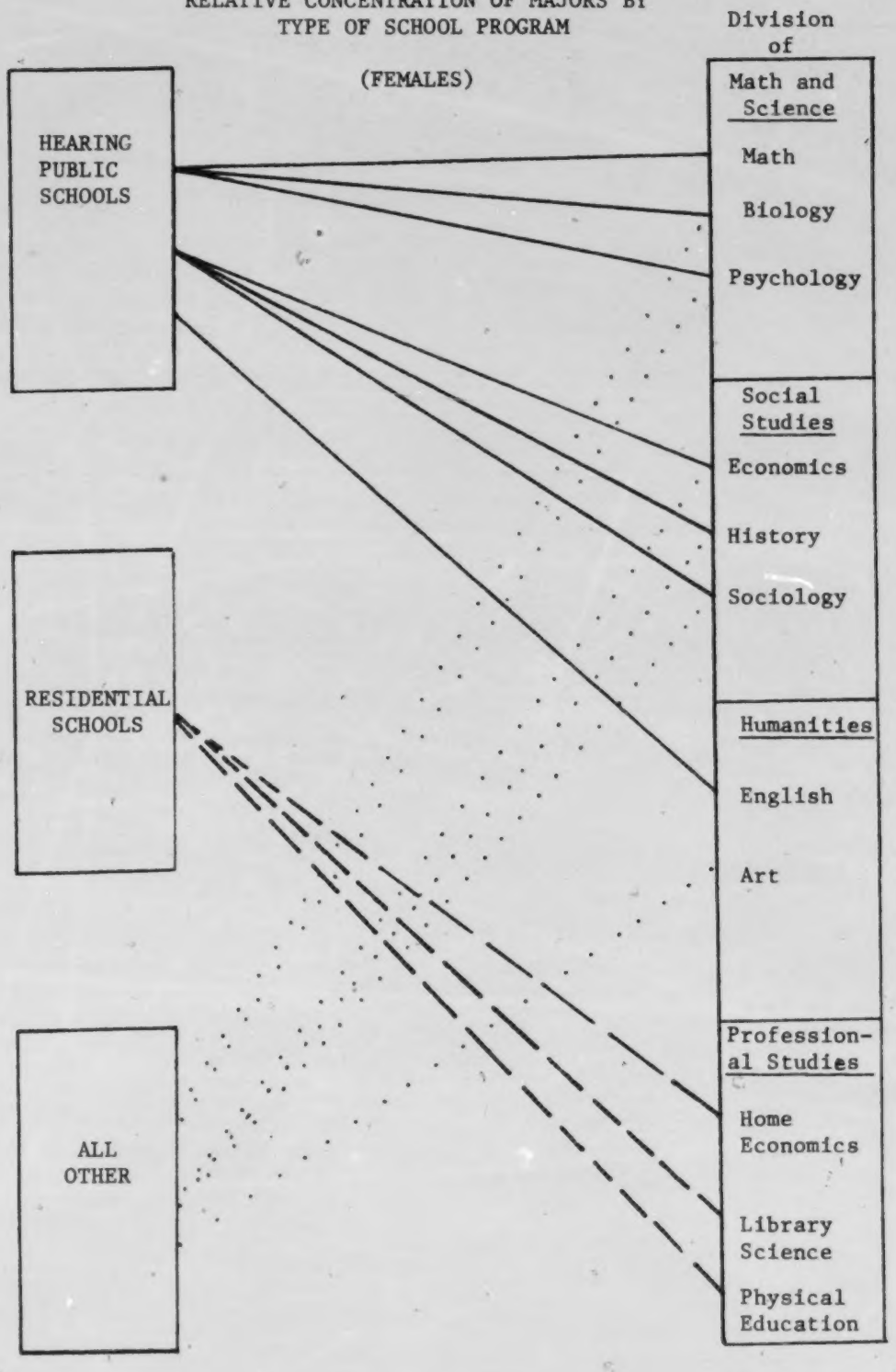
MAJORS BY TYPE OF SCHOOL PROGRAM GRADUATED FROM
(FEMALES)

Division & Major	Hearing Public School No.	%	Rel. Conc.	Residential School No.	%	Rel. Conc.	All Others No.	%	Rel. Conc.
Division of Science & Math									
Biology	3	25	119	5	42	67	4	33	206
Mathematics	6	32	152	11	58	92	2	10	63
Psychology	6	43	205	3	21	33	5	36	225
Division of Social Studies									
Economics	2	33	157	2	33	52	2	33	206
History	3	27	129	6	55	87	2	18	113
Sociology	5	29	138	6	35	56	6	35	219
Division of Humanities									
Art	4	17	81	13	54	86	7	29	181
English	9	25	119	22	61	97	5	14	88
Division of Professional Studies									
Home Economics	6	16	76	29	78	124	2	5	31
Library Science	6	8	38	58	81	129	8	11	69
Physical Education	3	17	81	14	78	124	1	6	38
All Others	5			9			2		
Total	58	21		178	63		46	16	

CHART 3

RELATIVE CONCENTRATION OF MAJORS BY TYPE OF SCHOOL PROGRAM

(FEMALES)



major choice. The opposite may be true for graduates of hearing public schools. In addition, the graduates of different secondary programs may have different views with regard to occupational outlook. For example, of residential school graduates are planning to enter non-scientific careers, it would be logical for them not to major in the Physical Sciences or Mathematics.

Another factor that may account for this differential choice is if the students perceive majors as having different degrees of difficulty. Thus, if the graduates of these various secondary programs have a general belief that certain majors are more or less difficult and majors are chosen based on this belief, a pattern such as found could emerge.

If it is shown that this pattern of relative major concentration based on school of graduation continues to exist, it may be of interest to analyze the reasons for this differential pattern in a much more detailed study.

As it was pointed out in Chart 1, the Gallaudet College graduate has two or three avenues he/she can pursue after graduation. These are to continue his/her education, to enter the labor force, or, in the case of females, to follow the path of full-time housewife. In order to get a picture of the proportions of Gallaudet College graduates in these areas, two charts will be presented for each group of males and females. The first chart in the series will present all of the paths taken by the graduates in percentage terms, while the second will present the relative concentration flows as was the case for major choices in the last sections.

As is evident from Chart 4, more than 70% of Gallaudet College male graduates that matriculated from public and residential schools, entered the labor force upon graduation and have not obtained a master's degree. This proportion is some 12 to 16 percent higher than the proportion of males from other programs.

A comparison of Gallaudet College male graduates that obtained the master's degree with males nationwide for this 1962-1972 time period is presented in Table 3.

It can be seen that a slightly higher proportion of our graduates obtained the master's degree when compared to all males. On an overall basis, therefore, the proportion of Gallaudet College male graduates, that obtained master's degrees, compares favorably with the nation as a whole.

Chart 5 indicates that the proportion of male students that obtained master's degrees or pursued careers without having the master's degree did not vary slightly depending upon which school the students originated. In general, it is shown in Chart 5 that public school students and students from schools other than residential

CHART 4

DISTRIBUTION OF MALE GRADUATES BETWEEN
WORK AND GRADUATE SCHOOL

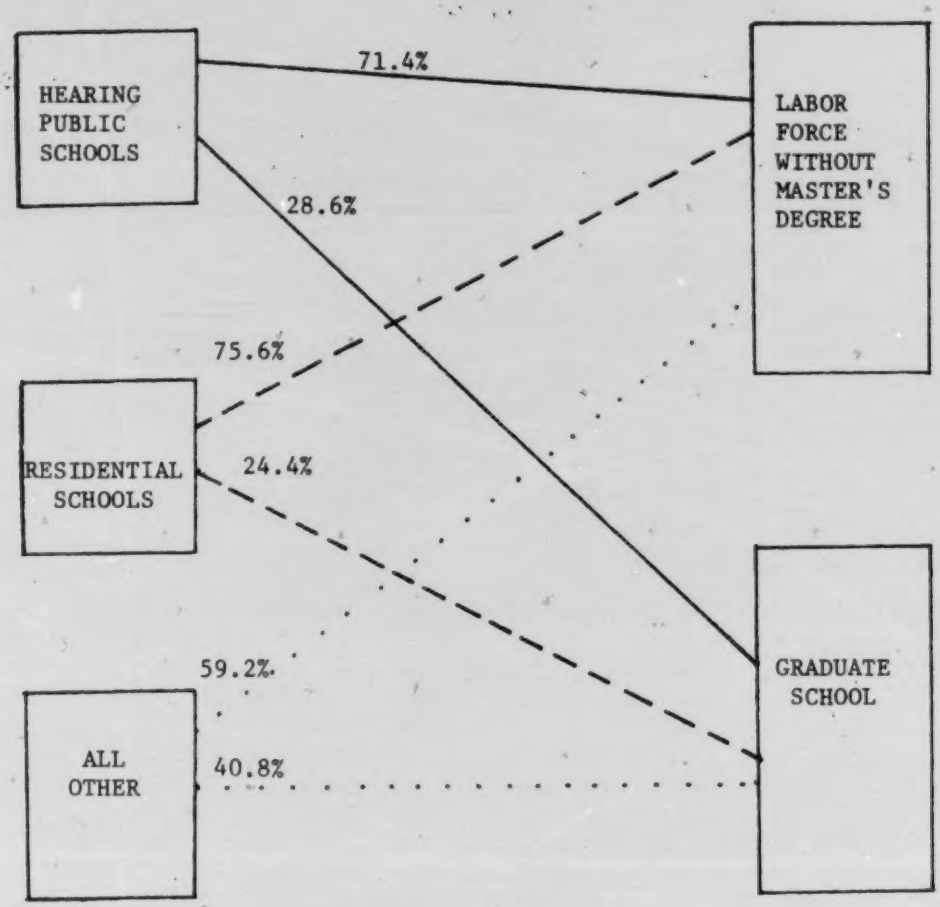


CHART 5

RELATIVE CONCENTRATION OF MALES BETWEEN
WORK AND GRADUATE SCHOOL

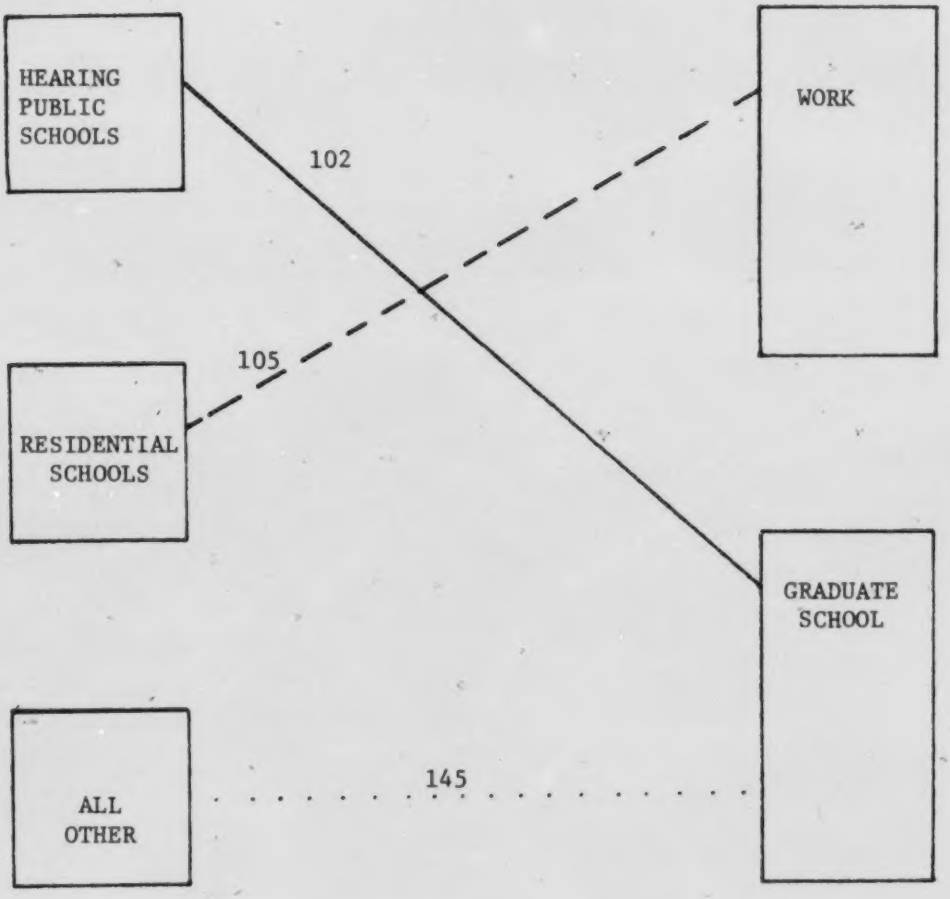


TABLE 3

EARNED DEGREES CONFERRED

MALES

(1962-1972)

	BA(1)	MA	%
Males Nationwide	3,684,000	964,000	26.2
Gallaudet College	298	84	28.2

(1) for years 1962-1971

schools had a tendency to enter graduate school in larger proportions than their respondent population distribution.

Chart 6 shows that between 55 and 59 percent of our female graduates have entered the labor force and have not obtained an advanced degree. It is apparent that the proportion of females entering graduate school ranges from a low of 10.9% for females from programs other than residential or public schools to a high of 20.7% for those that matriculated from public school.

Table 4 on the next page presents statistics on earned degrees conferred for Gallaudet College female graduates and other females nationwide for the 1962-1972 period.

It is evident from the above table that a higher proportion of our females obtain master's degrees when compared to the national average. Thus, the favorable comparison exhibited for males is also evident for our female graduates.

While a higher proportion of male graduate students came either from public schools or programs other than residential schools, this distribution is altered in the case of female graduates of Gallaudet College. It is shown in Chart 7 that a higher proportion of graduates of programs other than residential schools or hearing public schools enter graduate school when compared with the respondent distribution at Gallaudet College. This is shown in Chart 6.

However, if one measure of a college's success is the proportion of students that continue their education beyond the bachelor's degree, it can be said that Gallaudet College is indeed successful.

It can be seen from Chart 8 that a wide diversity of occupations is exhibited for the male survey respondents. A closer examination of the individual categories reveals that 27.3% of male public school graduates had entered the computer, mathematical, and accounting occupations. These occupational classifications were also areas of high relative concentration of majors for these graduates. While occupations in education were not over represented for this group, it did account for 20.8% of the occupations reported by male public school graduates.

A closer look at male respondents, that graduated from residential schools, reveals that approximately 39% of these graduates reported occupations in the field of education. Other areas of high relative concentration for this group of males was in Chemistry and machine trade occupations, specifically printing.

While the male graduates of other programs comprised the smallest total group of respondents, it should be noted that they had an extremely wide diversity of relative occupational concentrations. This group exhibited high concentration in the fields

TABLE 4

EARNED DEGREES CONFERRED

FEMALES

(1962-1972)

	BA	MA	%
All Females*	2,537,000	537,000	21.2
Gallaudet College	282	76	27.0

*1962-1971

CHART 6

DISTRIBUTION OF FEMALE GRADUATES

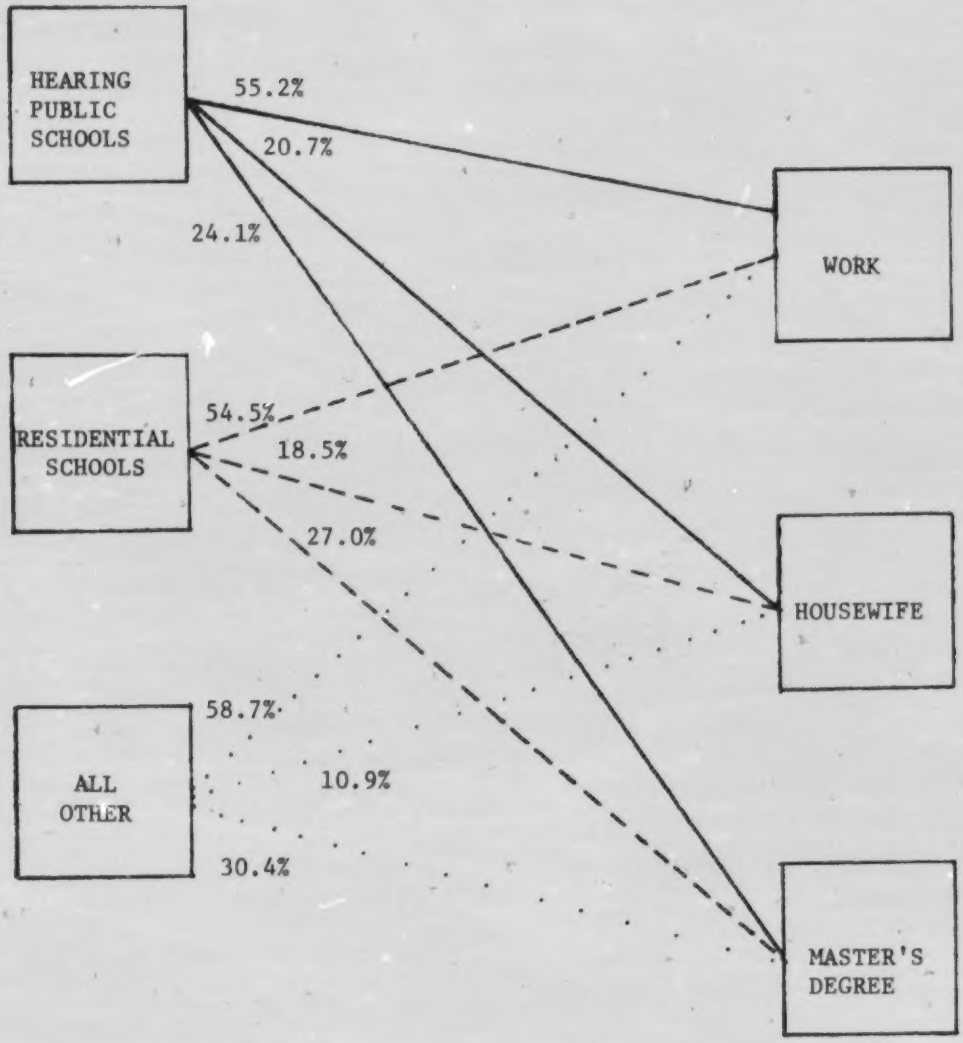


CHART 7

RELATIVE CONCENTRATION OF FEMALES

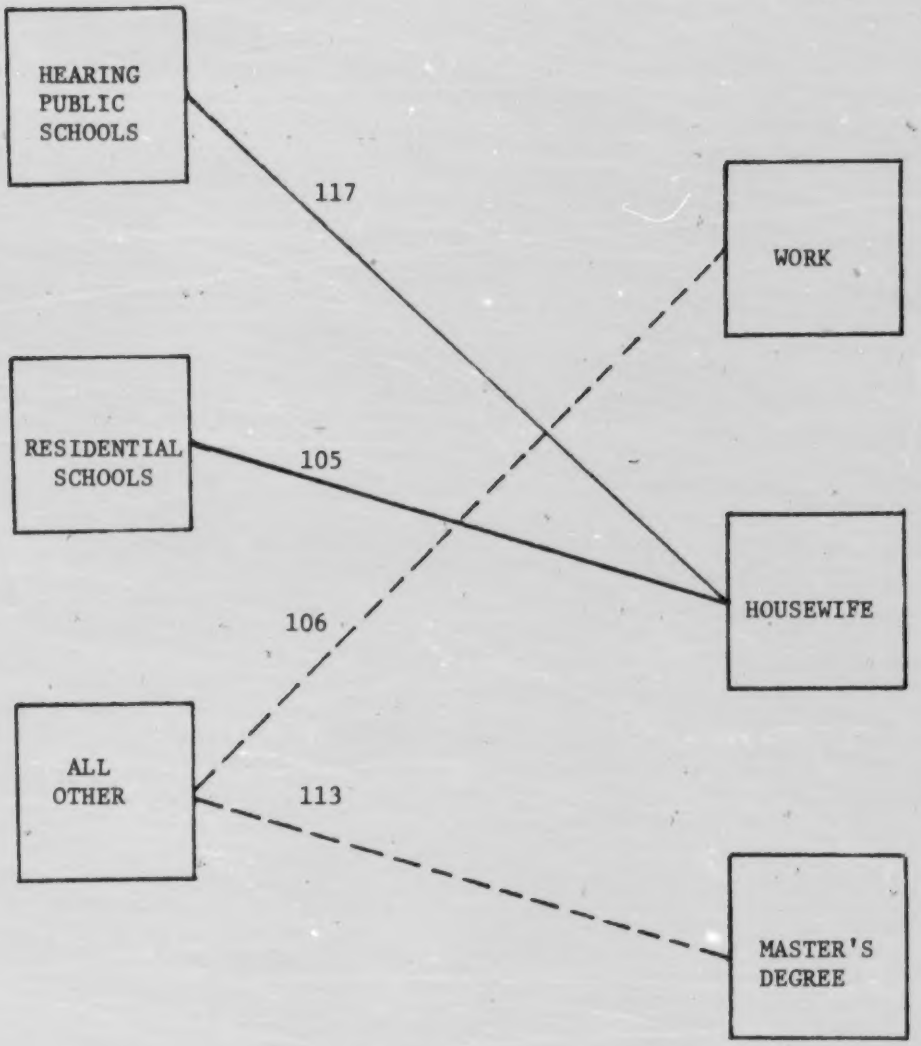
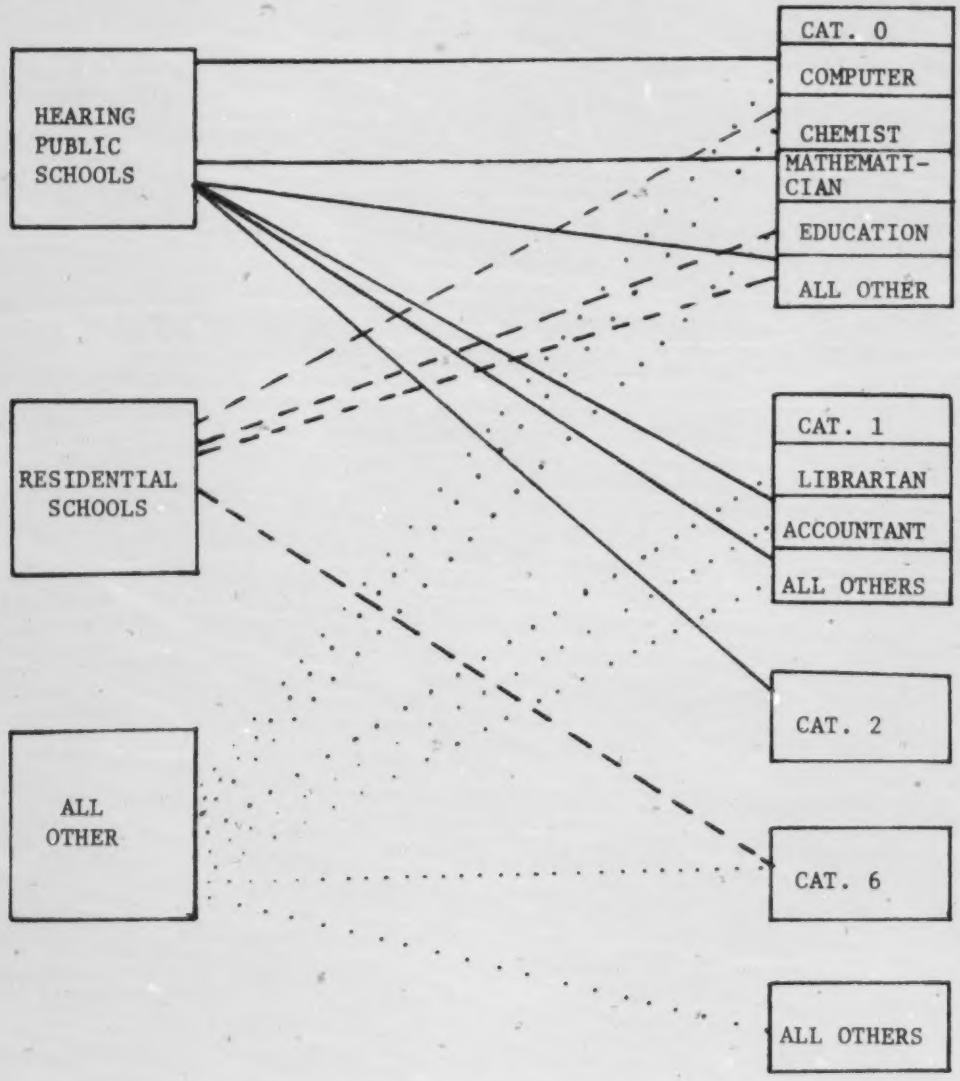


CHART 8

RELATIVE CONCENTRATION OF OCCUPATIONAL DISTRIBUTION OF MALES



of computer technology, chemistry, education, library science, accounting, and machine trades.

Chart 9 on the next page presents the occupational distribution of females based on relative concentrations. It can be seen that residential school graduates have concentrated in the fields of education and library science. These two occupations contributed 71% of all working female respondents from these schools.

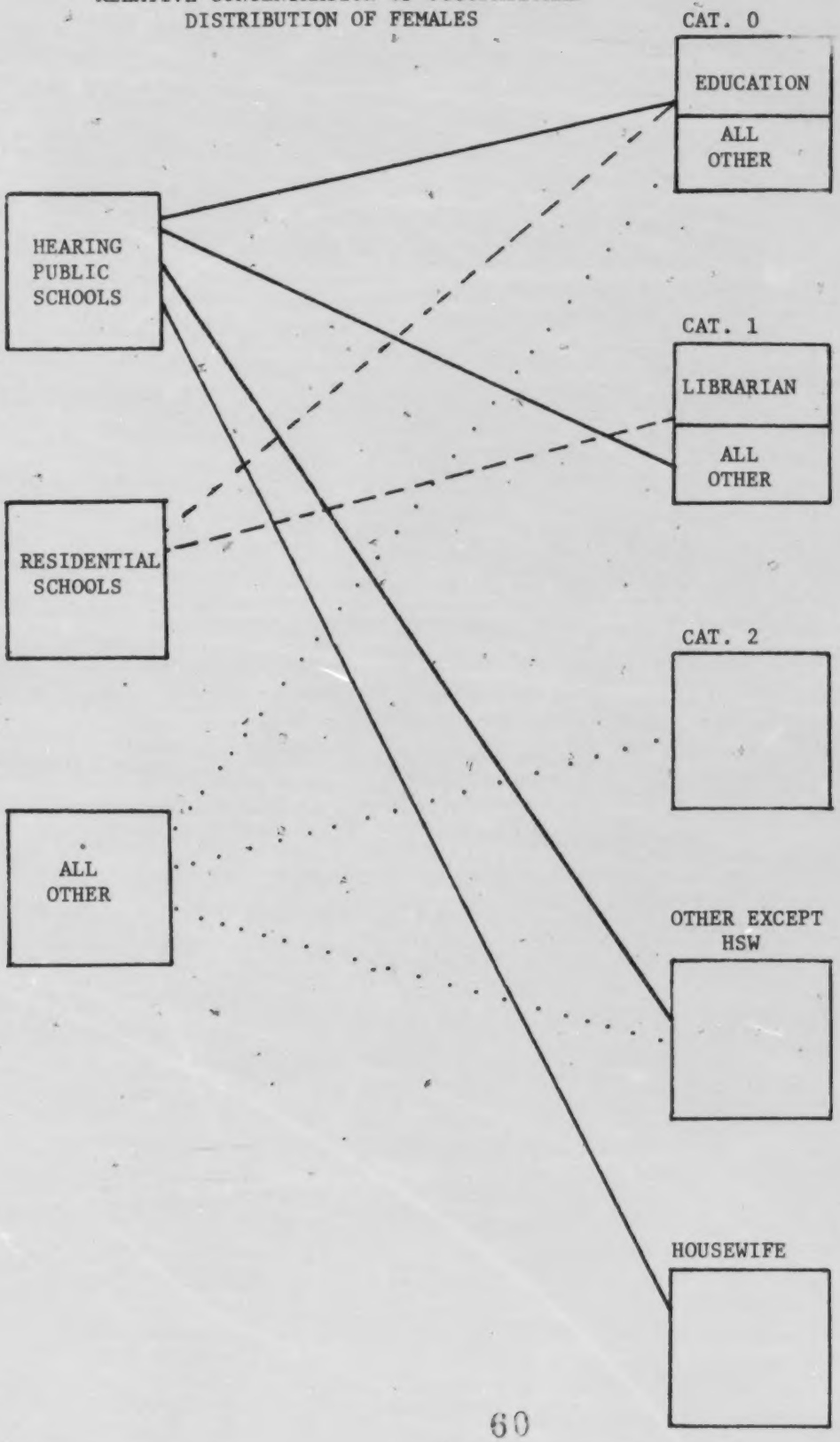
An examination of female public school graduates also reveals a heavy concentration in the field of education. This occupational group comprised approximately 61% of all working female respondents.

V. CONCLUSION

It appears that for whatever reason differences exist in major selection based upon school of graduation. Work is currently underway to expand the model to include a finer breakdown of the major-graduate school-occupational classifications.

CHART 9

RELATIVE CONCENTRATION OF OCCUPATIONAL DISTRIBUTION OF FEMALES



AN OVERVIEW OF THE EDUCATIONAL STATISTICS AND EDUCATIONAL RESEARCH ACTIVITIES OF THE OFFICE OF DEMOGRAPHIC STUDIES

Raymond J. Trybus
Director, Office of Demographic Studies

In the course of this symposium most of the senior staff members of the Office of Demographic Studies will be presenting reviews of the work in which they are presently engaged. What I want to do here is to review the history, the nature, and the purpose of the Office and to give some indication of the status of a variety of other projects in which we are presently involved.

The Office was established in February, 1966 in response to the need for national statistical information pertaining to hearing impaired children. The need for this sort of organization was a major topic and recommendation of the 1964 Bethesda conference "On the Collection of Statistics of Severe Hearing Impairments and Deafness," which was convened and supported financially by the National Institute of Neurological Diseases and Blindness (NINDB) as it was then known. The first name of the project, when it was established at Gallaudet College, was the "Model Reporting System," since part of the intention was to demonstrate the feasibility and methods of similar systems serving various groups of handicapped people. This name later became the "Annual Census of Hearing Impaired Children"; this was later changed to the "Annual Survey of Hearing Impaired Children and Youth," a name which has remained up to the present.

The Office operates on a service-oriented model, which has a variety of implications for the way we do business. First, we depend heavily on "consumer" involvement in the planning and directing of the Office's projects. The Office has a National Advisory Committee which meets annually to perform its planning and directing functions, and the members of this committee serve on an individual basis during the year as consultants, advisors, and reviewers. Thus, the Office's responsiveness to the expressed needs of people in the field of deafness is assured. A second basic feature of the operating model is that we report back regularly and directly to the sources of our data. Thus, in addition to published materials, the schools which serve as data sources receive a variety of tailored reports and communications from the O.D.S., some routinely, some on a request basis. This contact with our sources requires a great deal of staff time and money, but it is an essential feature of our operation and probably one of the reasons for the continuing high rate of voluntary participation of school personnel across the country in O.D.S. projects.

A third basic feature of our operation is that our first mission is to establish national baseline data, which serves as a reference point and a basis for further exploration by others. Finally, we pursue a flexible, user-oriented program of publication of our findings. Statistical monographs, research bulletins, journal articles, conference presentations, exhibit booths,

class lectures, telephone conversations, and extended correspondence are all used to disseminate the information collected. Publication mode is selected not by the "prestige value" of a journal or professional association, but by the "use value" to the educational and other practitioners who form our users and consumers.

One of our major methods of putting our data to use is by means of cooperative and collaborative efforts with other researchers. Let me review briefly some of the projects we are now doing or planning, in the hope that it will stimulate some of you to similar collaboration with us in the future.

°With Ms. Rosen of MSSD and Drs. Jordan and Gustason of the College, we are working on processing and analysis of data relating to the communication methods used at different academic levels in the schools and classes around the country. This work is intended to lead to a directory of some kind to make this information generally available to parents, researchers, and other interested parties.

°With faculty members of the Department of Education, we have assisted in designing, conducting, and data processing of surveys relating to curricula in programs for the multiply handicapped, and relating to the post-graduation experiences of graduates from the program.

°We are in the process of conducting, on contract with the MSSD and the NCEMMH, two surveys relating to the curriculum materials used in schools and classes for the deaf, the areas in which improvements are desired, and the extent to which the programs are willing to collaborate with MSSD in field evaluation of new materials.

°With a Catholic University professor and his graduate students, we are involved in factor analyses and other sophisticated statistical analyses of the achievement test performance of hearing impaired children, with an eye to uncovering very specific areas of strength and weakness which can be incorporated into school curricula.

We are planning a variety of other studies to be done by our own staff in the coming year or two. Let me share some of these with you now.

°Probably in fiscal year 1978, we will conduct a re-survey of the achievement of hearing impaired children nation-wide, to determine if there are any upward or downward trends.

°We have applied to the Bureau of Education for the Handicapped for grant funds to conduct a three-year study of the status

of career education programs for hearing impaired children, and the degree to which students aged 16 though 24 can demonstrate various decision-making and problem-solving skills which are crucial to vocational success.

°We are in the process of developing a grant proposal for a multi-year project to investigate the status of preschool or early childhood education programs for hearing impaired children, and to develop some kinds of national norms for developmental achievements in these early years of life.

°We are beginning the development of an "Institutional Survey #2" to be used in fiscal year 1977 or 1978. Last year we surveyed schools and classes regarding the personnel, facilities, and services they offer. This new survey would add to that data a variety of other information regarding, for example, religious education programs, the provision of services for emotionally disturbed deaf children, etc. Those of you who are interested in similar items are invited to contact us to discuss the issue for possible insertion into "Institutional Survey #2."

That will give you a good overview of some of the current and planned activities of our Office, as well as some of the history of our own development as a national research and statistical organization and as a part of Gallaudet College. If you think we might be of service to you, please do not hesitate to call on us.

UPDATE ON POSTSECONDARY PROGRAMS FOR HEARING IMPAIRED STUDENTS

Brenda W. Rawlings
Office of Demographic Studies

For almost a century, hearing impaired individuals who sought postsecondary education with the provision of special educational services had only one choice of an institution, and that was Gallaudet College. Their choice was also limited to the liberal arts curriculum which Gallaudet offered.

Then in the early 1960's a number of postsecondary institutions began providing special educational services for deaf youth, and with this there existed a broadened facet to the education of our hearing impaired young people.

In 1973, Dr. Ross Stuckless of the National Technical Institute for the Deaf and Dr. Gilbert Delgado of Gallaudet College published a directory of postsecondary programs providing special educational services to the hearing impaired.

In 1975, the Office of Demographic Studies (ODS) was asked to revise this directory, and in November 1975 the revised edition of "A Guide to College/Career Programs for the Deaf" was released.

Data Collection

The ODS contacted all known and suspected postsecondary programs for deaf students. A total of 68 programs were contacted in the spring of 1975; this included 63 programs in the U.S. and 5 in Canada.

Of this number:
- 8 did not respond to the questionnaire and repeated follow-ups;
- 6 programs indicated they did not currently have a program for deaf students or that it was not at the postsecondary level; and
- 1 program indicated it did not want to be listed.

A detailed questionnaire was sent to each institution and information collected on a variety of topics.

In determining which of the remaining 53 programs would be listed in the Guide, the editors reviewed the data reported by respondents. The guidelines found in the CEASD publication, Principles Basic to the Establishment and Operation of Postsecondary Education for Deaf Students, were used in reviewing each program.

The criteria for inclusion in the Guide were:

(a) the program have a minimum of 10 full-time students;

(b) the program have a full-time director specifically for the deaf program or a part-time director who devoted a minimum of 50% of his time to the deaf program;

(c) program accept students directly from high school;

(d) that it be part of an accredited postsecondary program, and

(e) that there is general compliance with the CEASD principles.

Ten programs did not meet these initial criteria and were not listed in the Guide. However, the ODS is maintaining information on these programs and has invited persons to contact it directly should they want information on these programs.

Findings

In terms of geographical representation, 23 states, the District of Columbia, and two provinces are represented. By regions, the Northeast has five programs, the South 12, and the North Central part of the country has 10 programs, and the West has 14. California has the largest number of programs with nine.

The size of enrollment at each of the programs ranges from a minimum of 10 students to over 800 at Gallaudet.

The total number of students reported to be attending these programs on a full-time basis was 2,909 and 52% of these students were at either Gallaudet or NTID. There were an additional 273 students enrolled in 43 programs for the deaf on a part-time basis.

Perhaps worth mentioning at this point is that for 26 programs for which data are available for both 1973 and 1975, 14 programs had increased their enrollment and 12 had decreased in size over the two years. For these same programs there was a net growth, however, of 139 students.

Of the 43 programs reported in the 1975 edition of the Guide, 14 were established in the 1960's and 28 during the first five years of the 1970's; two-thirds of the programs, therefore, have been in operation for less than five years.

During 1975, 617 students were awarded degrees from these programs and 41% of these were at the Certificate/Diploma level, 28% were bachelor's degrees, 24% associate degrees, and 7% at the master's or doctoral level.

A number of items were asked on the questionnaire about the organization of the deaf programs. Eighty-one percent of the programs reported having a full-time director or administrator whose sole responsibility was the program for the deaf. All but one program indicated that the regular personnel policies and practices of the host institution applied to the staff of the program for the deaf.

Fifty-eight percent of the programs indicated they provided an in-service training program for staff members of the institution who would be working with the deaf students.

With regard to special services provided deaf students, almost 75% of the programs reported offering a preparatory program for entering students. The scope and content of what is referred to as a "prep" program greatly varied. In some places this was required, and in other instances attendance was an option left open to the discretion of the students and faculty. The duration of the "prep" programs ranged from a few days to one year in length.

Fourteen of the programs indicated that they did not have manual communication classes regularly available to those instructors who taught without the aid of interpreters and that these instructors were not expected to take formal training in manual communication if they were not proficient in sign language.

Almost half of the programs indicated that they did not diagnose the speech and hearing of every entering deaf student nor that clinical services of speech therapists and/or audiologists were regularly available.

The programs were asked to report the curriculum areas or careers that students in the deaf program were majoring in during the 1974-75 school year. These specific majors are presented in the Guide for individual programs and are summarized according to the "Career Clusters" suggested by the U.S. Office of Education.

For those for whom information were reported:

__ 26% were majoring in topics related to Business and Office;

__ 20% were majoring in Fine Arts and Humanities;

__ 11% in the Public Service area;

__ 11% in the cluster called Communication and Media;

__ 11% in Manufacturing, and

__ 5% in Health careers.

The remaining 16% were spread out over eight other career areas.

In comparing these figures and percentages with the information which was reported in the 1973 Guide, it is of interest to note that there have been increases in the numbers and percentages majoring in the areas of Fine Arts and Humanities, Public Services, and Health Careers.

There are sharp decreases in those enrolled in the areas of Transportation, Construction, and Product Services.

Implications

Some possible implications for Gallaudet from these findings suggest that the overall enrollment is unlikely to change even with the establishment of these new programs. The enrollment figures for the two year period show only a miniscule drop in the Gallaudet enrollment. The increased selection of majors in the Fine Arts and Humanities also speaks to Gallaudet's tradition of providing a liberal arts training.

Recall that 24% of the recent graduates of these programs earned associate degrees. This may indicate that more students may be entering Gallaudet in the future at the Junior level to complete work for a bachelor's degree. This could hold some implications for a change in the composition of the student enrollment. It also poses questions for the administration with regard to transfer of credits from one institution to another.

With regard to the special services offered in these programs, there appeared to be some lack of in-service training at these various institutions for those on the faculties who come in contact with hearing impaired students. Perhaps Gallaudet could be an active source of information for programs desirous of establishing such training programs. Assistance might also be provided in the area of developing speech and hearing services for the entering students.

The growth of these new programs for postsecondary students appears to provide not only a fertile area for interested researchers but also an area where Gallaudet, with its many years of experience, can offer great assistance.

LONGITUDINAL OBSERVATION OF DEAF AND HEARING INFANTS' VOCALIZATIONS

Michael A. Karchmer
Office of Demographic Studies

George F. Cairns, Jr. and Earl C. Butterfield
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I would like to share with you early results of some ongoing research at the University of Kansas Medical Center. I will try to give special emphasis to how this work relates to hearing impaired infants. In that regard, I have a very simple message, which is that the vocalizations of deaf infants seem to differ systematically from those of hearing infants much earlier than has previously been suspected.

During his first year, a normal infant's vocalizations change from undifferentiated cries to approximations of words. How does this happen? While there are data about infant vocalization, little of it describes the sequential, longitudinal development of individual infants' vocal productions. Even fewer data compare normal development with hearing impaired infants' development. I would like to briefly characterize some of the existing data on quantitative changes in vocalization.

The most comprehensive study of quantitative change in infants' vocalizations was conducted by Irwin and his colleagues at the University of Iowa during the 1940's. The importance of this work was that it demonstrated that systematic changes in vocalizations do take place during the first 18 months of life. However, for the present purpose--which is to describe changes in individual infants--this work is clearly limited: Irwin presented grouped data only, and it is now impossible to derive developmental trends for individual infants. We tried to obtain the original protocols. Unfortunately, they appear to have been lost in the 35 years since they were collected. Whether the developmental patterns which Irwin showed for groups also characterize individual infants cannot be known.

Hardly any data compare individual normally developing infants with at-risk infants. Perhaps the most widely cited study was done by Lenneberg, Rebelsky, and Nichols (1965). They observed the vocal behavior of 10 infants with hearing parents and six infants with deaf parents. One of these six was hearing-impaired himself. Using a voice-activated tape recorder, Lenneberg et al. obtained samples of the infants' vocalizations approximately once every two weeks from the ages of about two weeks to three months. Individual subject comparisons of a number of different classes of vocalizations led Lenneberg (1964) to conclude that "neither deafness nor deaf parents reduces the sound activity during the first six months to any appreciable extent." Serious questions about this study's method have been raised. But even if the study was adequate in all other respects, it examined only one deaf child. A few data points from a single deaf infant cannot justify the conclusion that all deaf infants develop normally up

to six months of age. It is important to keep this in mind, because the Lenneberg conclusion has now entered the textbooks and is often cited as basic evidence for a particular point of view of language acquisition. But that is another story.

Marya Mavilya has collected additional information about the vocal behavior of deaf and normally hearing infants. For her 1969 dissertation at Columbia University, she studied the development of three hearing-impaired infants and of a single normally hearing infant between the ages of 12 and 26 weeks. When she published her findings, Mavilya (1972) followed Irwin's lead and reported only a broad phonetic transcription of the infants' vocalizations. In her dissertation, however, she described a simpler classification, and it caught our attention. She classified all of her infants' utterances either speech or non-speech. Speech was defined as identifiable vowels and consonants. Non-speech included such sounds as burps, grunts, gurgles, and hiccoughs. She found that speech sounds of the hearing-impaired infants' were infrequent. The normally hearing infant's level of speech activity was much higher, and it seemed to increase as he grew older. Since she collected only four data points from the hearing infant, this result must be regarded cautiously. However, if other normally hearing infants reliably increase their speech rate between 12 and 26 weeks, then we could conclude that hearing-impaired infants show abnormal vocalization patterns as young as three months of age.

The substantive purpose of our initial effort was to longitudinally trace changes in the rate of speech and non-speech vocalization across the first weeks of life. To do this, we first had to demonstrate the reliability of an observational procedure. Otherwise, comparison of our findings with Mavilya's from hearing-impaired infants would not be conclusive. Our broader methodological goal was to show that a simple observational procedure involving numerous measures and systematic reliability checks has rich potential for tracking the early vocal development of individual infants.

Let me tell you briefly about whom we studied, how the information was collected, and how these data were analyzed. Our subjects were two male infants. Infant D was recorded from one through 20 weeks of age. Infant R was observed from four to 32 weeks. Both infants heard normally. However, D's parents heard normally, while R's parents were both deaf.

Our data consisted of 10-minute samples of the infants' vocalizations tape recorded an average of four separate days each week. The tape recordings were made at home by the infants' mothers. The mothers were encouraged to do the recordings approximately the same time each day and to make the sessions part of the infant's schedule. The mothers were asked not to interact verbally with the infant during the taping and not to come into the infant's line of sight.

Our scoring procedures were a little unusual, so I will describe them in a little detail. Following Mavilya's procedure, recorded vocal productions were classified as either speech or or non-speech. A non-speech vocalization was any of the following list, as defined by Webster's New International Dictionary: chuckle, laugh, cry, out-cry, grunt, struggle grunt, whimper, sputter, sneeze, snort, smack, yawn, gasp, sigh, cough, coo, hum, hiccough, suck, and hum. All other utterances made by the infant were regarded as speech. Thus, all of the infant's vocalizations are classified as either speech or non-speech.

Two observers together scored all of the tapes, a total of 169 separate 10-minute recordings. When scoring, the observers were told neither to which infant they were listening nor the age of the infant when the recording was made, and the samples were ordered unsystematically. The two observers scored each tape simultaneously, listening through earphones.

In scoring a tape the observers first listened to the session in its entirety. Each made notes of when the vocalizations occurred, using a chart which was (as were the tapes) marked off in 30-second blocks. Although only one such preliminary pass was usually necessary, parts or all of the session could be repeated until both observers were satisfied that they had noted all vocalizations. The observers never compared notes.

Using the notes as cues of when to expect vocalizations, the observers listened to the tapes again. This time each held two buttons: one for classifying speech, the other for classifying non-speech vocalizations. When an observer decided that she heard a vocalization, she pushed the appropriate button and held it until the utterance ended. The observers worked simultaneously, but independently.

A number of measures were extracted. Among them was the total number and the duration of speech (s) and non-speech (ns) sounds during each session, recorded separately for each observer and for both observers together.

The response measures reported here are the mean weekly speech and non-speech vocalization rates, defined as the simultaneous press by both observers of either the speech or non-speech button. According to this "observer overlap" criterion, only one observer pressing a button would not be counted as a vocalization, nor would the case of one observer pressing the speech and the other the non-speech button. Only simultaneously overlapping button presses of the same classification were counted.

How reliable were these techniques? The issue of reliability is of course a critical one in this kind of observational research. Defining the response in terms of exact observer overlap as we did has a clear advantage: Our dependent measure is reliable by definition. Moreover, conventional reliability checks

are made simply, and they show that the measure is entirely satisfactory. A comparison of the two observer scoring patterns separately shows close agreement. (The correlations between the two observers on the weekly average rates were between .94 and .98.) Also, the overlap measure correlates highly with the average of the separate scorings of the two observers (all r's greater than .93). The overlap measure is the more conservative of the two, giving rates about 80.9% of those produced by averaging the two observers separate scorings.

The basic results may be stated simply. The two infants' rates of speech sound production increased systematically across the periods over which they were observed. Their non-speech vocalizations declined dramatically over the same period. Figures 1 and 2 show for the two infants the log of weekly mean speech and non-speech vocalization rates plotted against weeks of age. The rates were converted to logs because doing so provides the best linear fits.

For speech sounds the rates increase across time. For D, the correlation between age and mean weekly log speech rate is 0.79, p 0.01, and for R, the correlation is 0.38, p 0.05. The difference between these correlations is significant, $z = 2.06$, indicating that D's rate of increase was faster than R's. Since R had deaf parents, this finding is intriguing, and is certainly worthy of follow-up on a larger scale. For non-speech vocalizations, the rates of both infants decline, and to a similar extent. (The correlation of age and log vocalization rate for non-speech sound is -0.86 for D and -0.80 for R.) Figure 3 compares our data collected with those collected by Mavilya. Both sets of findings are expressed as the amount of time that each infant spent making speech sounds relative to the amount of time he spent in vocal activity.

Making direct statistical comparisons between two different studies is risky at best. However, the differences between Mavilya's three hearing-impaired infants and the two normally hearing infants observed here could hardly be clearer: With the exception of a single data point, there is no overlap at all between the two sets of data during the entire period for which comparison is possible. On the other hand, the data that Mavilya recorded from one normally hearing infant are roughly similar to our own. Thus, there is the strong suggestion that hearing-impaired infants as young as three-four months engage in relatively less speech activity than do normally hearing infants.

To summarize, this study has demonstrated that a simple observational technique can be used to study the development of vocal behavior of individual infants. Although the data were collected in non-manipulative settings in the home, the data are as stable and as regular as any laboratory-generated findings from infants this young. The data thus suggest that clinically useful language assessment may now be possible. Frequent obser-

vations of vocal behavior can provide systematic, individually-reliable information.

Dramatic changes in the distribution of both infants' speech and non-speech activity began during the second month of life. The large number of observations collected from each infant lends considerable weight to the conclusion that systematic changes in vocal behavior occur as early as we can measure them, and the collection of more data to confirm this finding is warranted.

The comparison of the hearing-impaired with the hearing infants provides tantalizing evidence that the patterns of vocal activity of deaf infants may diverge from those of hearing infants far earlier than has previously been suggested. The notion that deaf and normally hearing infants respond similarly until the end of the babbling period thus appears incorrect.

Figure Captions

Figure 1. Mean weekly rate of production of speech sounds for two infants.

Figure 2. Mean weekly rate of production of non-speech sounds for two infants.

Figure 3. Comparison of duration of speech-sound activity for Mavilya's three hearing-impaired infants, Mavilya's normally hearing infant, and two normally hearing infants D and R (each data point plotted as the average of the raw score for that week and the two adjacent weeks).

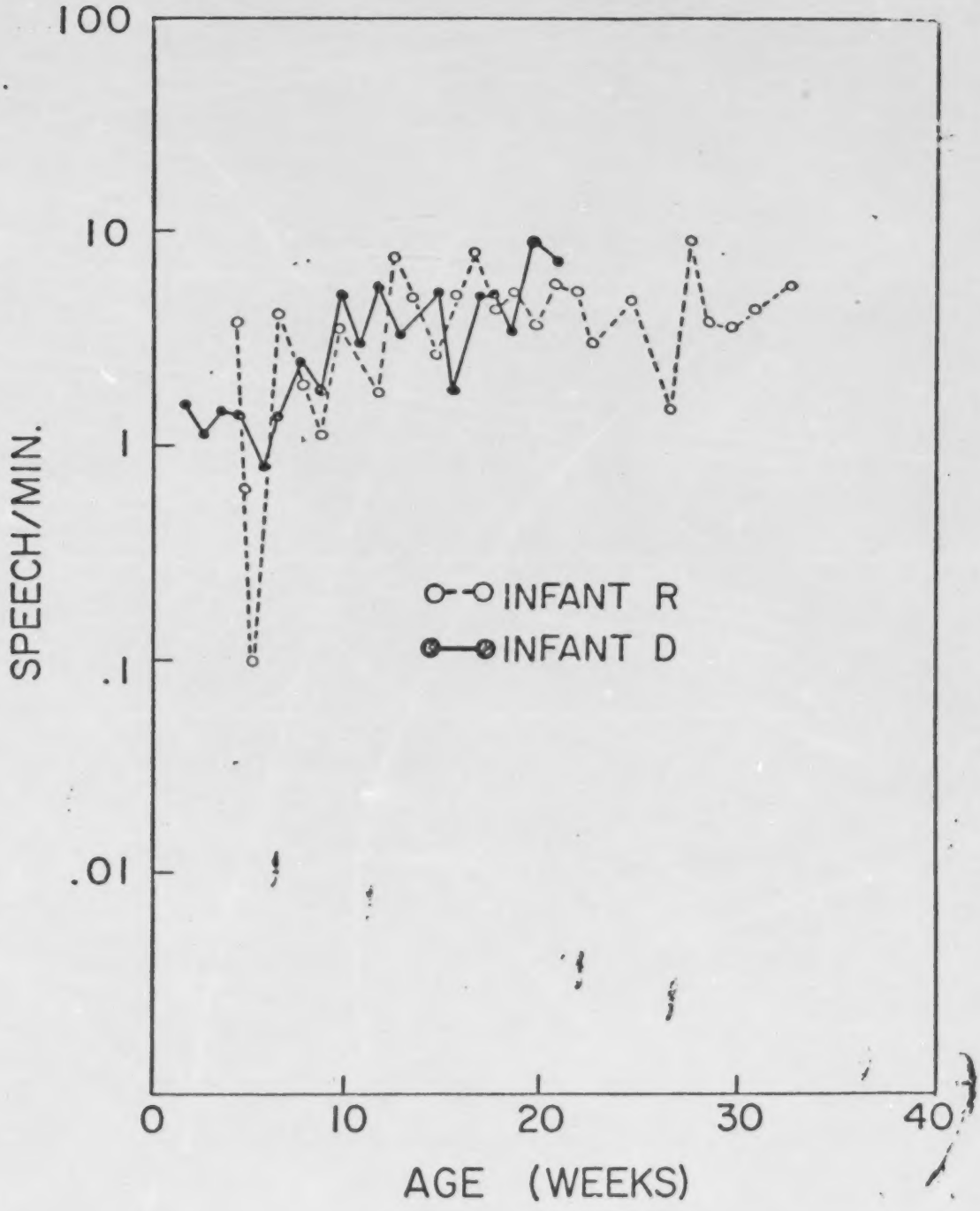


Figure 1

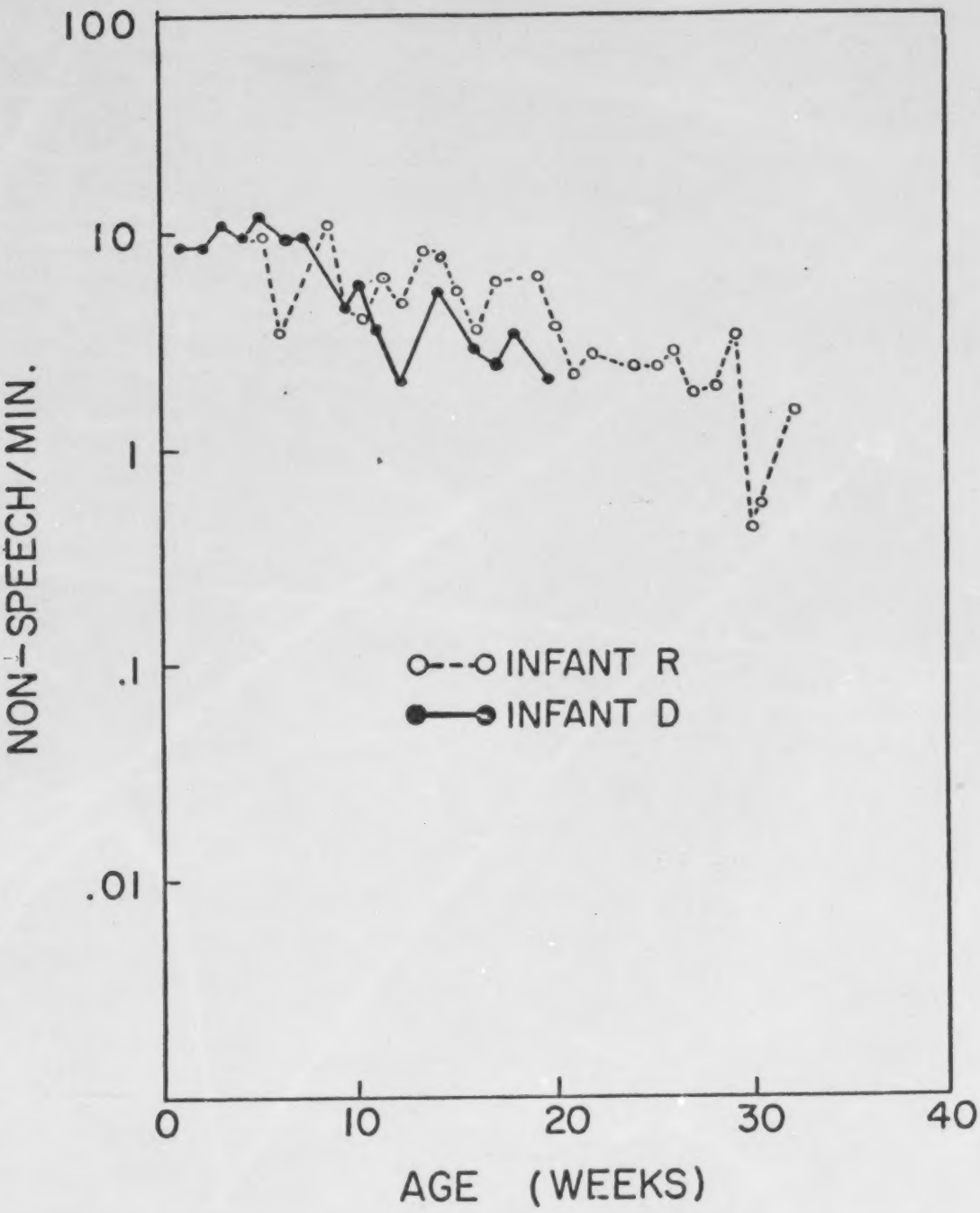
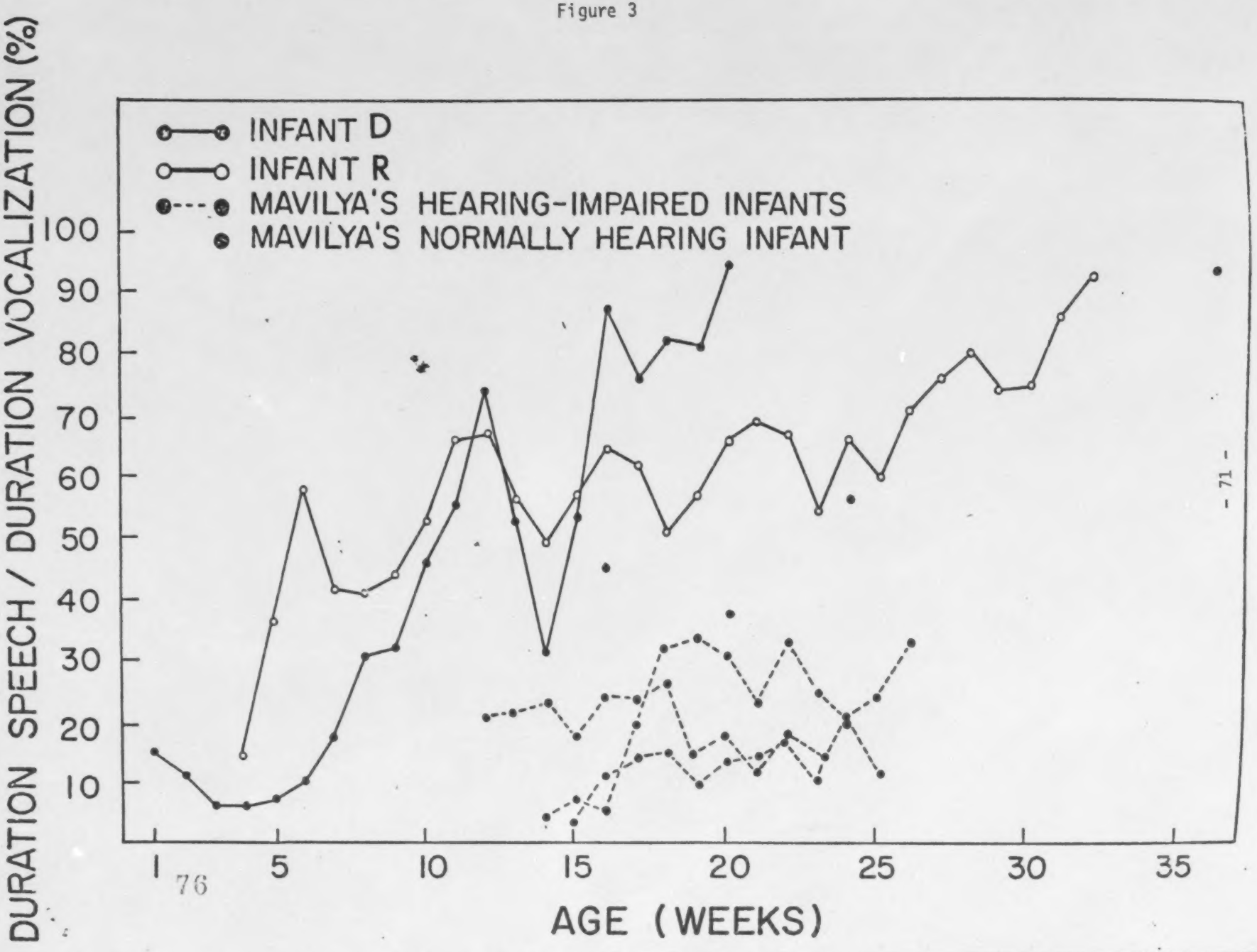

100
10
1
.1
.01
NON-SPEECH/MIN.
INFANT R
INFANT D
0
10
20
30
40
AGE (WEEKS)

Figure 2

Figure 3


INFANT D
INFANT R
MAVILYA'S HEARING-IMPAIRED INFANTS
MAVILYA'S NORMALLY HEARING INFANT
DURATION SPEECH / DURATION VOCALIZATION (%)
100
90
80
70
60
50
40
30
20
10
1
5
10
15
20
25
30
35
AGE (WEEKS)

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THE RELATIONSHIP OF NONVERBAL INTELLIGENCE TEST SCORES TO SELECTED CHARACTERISTICS OF HEARING IMPAIRED STUDENTS

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Office of Demographic Studies

Introduction

Testing has a bad press these days. Whether the subject is achievement testing or the measurement of native ability through IQ tests, the opposition is vocal and often vociferous. An entire issue of the National Elementary Principal journal was recently devoted to IQ testing; the authors were almost entirely critical of this type of testing.

It is not difficult to understand the objections to testing in general and to intelligence testing in particular. Test results can be and undoubtedly have been used to label, to categorize; isolated from functional criteria regarding an individual's adaptive behavior, IQ scores are often misleading and even dangerous. In recent years intelligence tests have also been heavily criticized for being culturally biased and therefore unsuitable for measuring the abilities of certain minority groups in this country. Other objections to tests center around the construction and validity of many test items.

Objections and criticisms such as these have persuaded some large public school systems to eliminate IQ testing from their pupil evaluation programs.

IQ Tests and the Deaf

It is not difficult to see the possible relevance of these same objections in regard to intelligence testing of hearing impaired individuals. In a review of 50 years of research on the intelligence of hearing impaired children, Vernon (1968) pointed out that in the early part of this century deaf children were scoring in the mentally retarded range on the verbal IQ tests administered them. The unsuitability of verbal measures for language deprived children quickly became apparent to test examiners, who then began administering nonverbal IQ tests to hearing impaired individuals. The results of this nonlanguage testing of deaf students revealed a range of scores similar to that for hearing children.

In addition to the nonverbal measures, Vernon (1968) has stressed two other methodological factors which can strongly influence the test scores of deaf and hard-of-hearing children. The first is the use of group testing as opposed to individual testing. The early intelligence tests of deaf children which resulted in scores in the retarded range were administered in groups, a procedure which is unsuitable for hearing impaired persons. The second factor which can influence test scores is the knowledge and familiarity with deafness and deaf individuals

possessed by the test administrator. Scores of deaf children generally improve when the examiner is experienced in communicating with these children and is familiar with their language deprived background.

Data from the Office of Demographic Studies

During the 1970-71 school year, the Office of Demographic Studies (ODS) at Gallaudet College collected information on over 41,000 hearing impaired students in special education programs throughout the United States. In addition to the demographic data collected, the ODS also gathered IQ information on the students who were reported to the ODS by the 555 programs and schools which participated in the Office's Annual Survey of Hearing Impaired Children and Youth during the 1970-71 school year. The information requested on the Survey form included whether the student had been tested or not, the name of the test, including test level, the verbal and nonverbal test scores, and the date the student had been tested. Other pertinent information that could have been collected--e.g., profession of examiner--was precluded by the length of the full Survey form.

The 555 schools participating in the Survey reported nonverbal IQ scores for 21,307 hearing impaired students. Three tests--the WISC, the Leiter, and the Hiskey-Nebraska--were used with over 15,000 of these students. Table 1 indicates the number of students who took each test; the "All Other Tests" category includes approximately 80 different tests (taking into account various forms, editions, and revisions.)

Table 1: Number of Nonverbal IQ Scores, By Test

Total Test Scores	21,307
WISC	7,468
Leiter	5,815
Hiskey-Nebraska	2,154
Merrill-Palmer	857
Chicago	652
Arthur	591
California	572
WAIS	499
Stanford-Binet	358
All Other Tests	2,341

As indicated earlier, the ODS each year collects basic demographic information on the students in its Annual Survey. The results of an examination of the relationship between this demographic information and the IQ scores of these students are given in the following paragraphs.

One of the questions asked in the Annual Survey for the 1970-71 school year was the birthweight of the student. Figure A shows the relationship between the nonverbal intelligence test scores and the students' birthweights.

Figure A: Birthweight and IQ (1970-71)

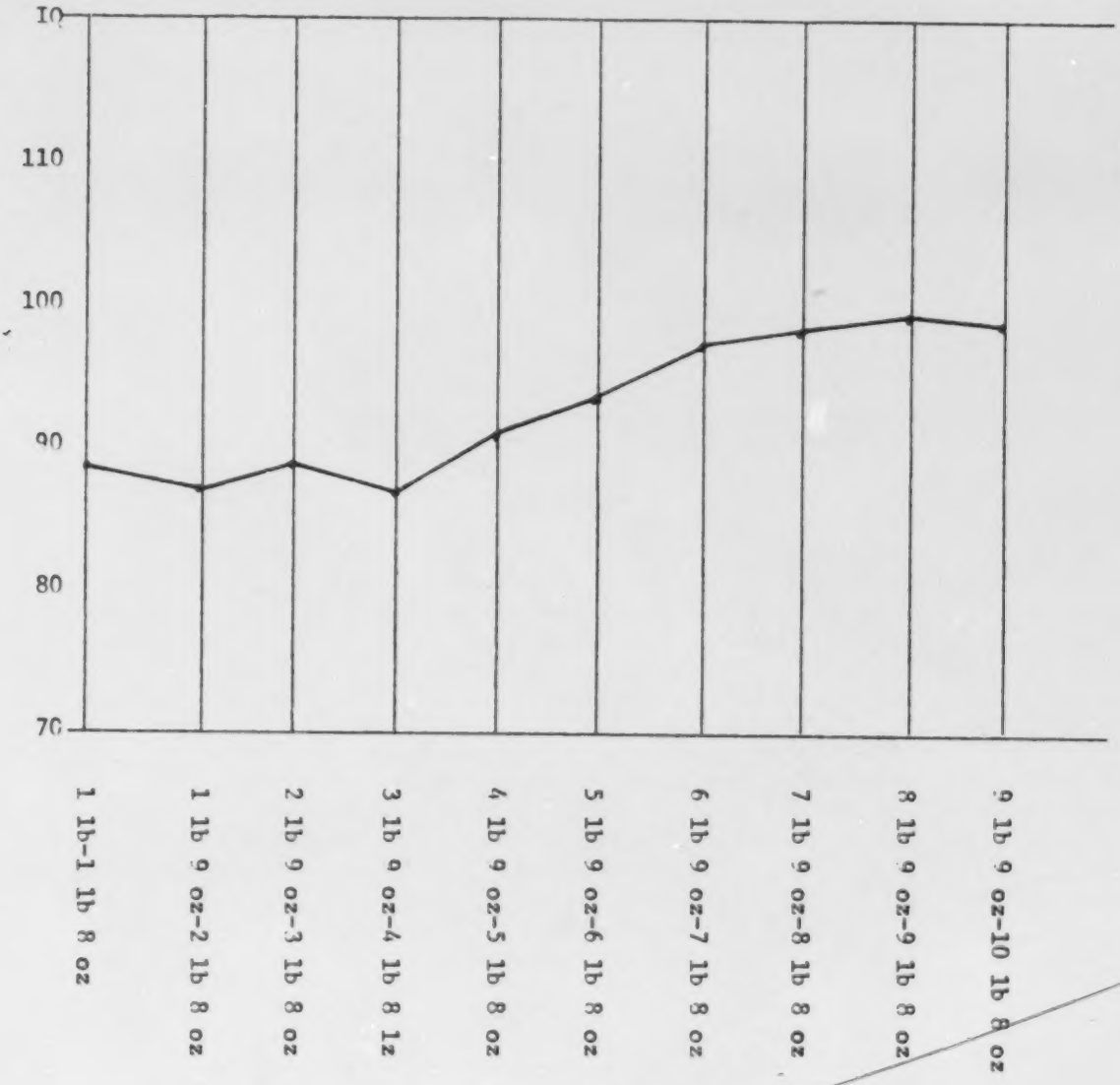

IQ
110
100
90
80
70
1 lb-1 lb 8 oz
1 lb 9 oz-2 lb 8 oz
2 lb 9 oz-3 lb 8 oz
3 lb 9 oz-4 lb 8 lz
4 lb 9 oz-5 lb 8 oz
5 lb 9 oz-6 lb 8 oz
6 lb 9 oz-7 lb 8 oz
7 lb 9 oz-8 lb 8 oz
8 lb 9 oz-9 lb 8 oz
9 lb 9 oz-10 lb 8 oz

Figure A reveals that, in general, the scores gradually increase as the birthweights increase, with the highest average IQ score (99.5) being recorded in the 8 1/2 pound to 9 1/2 pound range. This is not surprising, of course. The underweight babies are the premature babies, and the latter children are those with the physical and mental handicaps which often result in lower IQ scores. This is true of both hearing and hearing impaired children.

The presence of handicapping conditions in addition to their hearing impairment is an important factor in the education of deaf and hard-of-hearing children. Table 2 reveals that there is

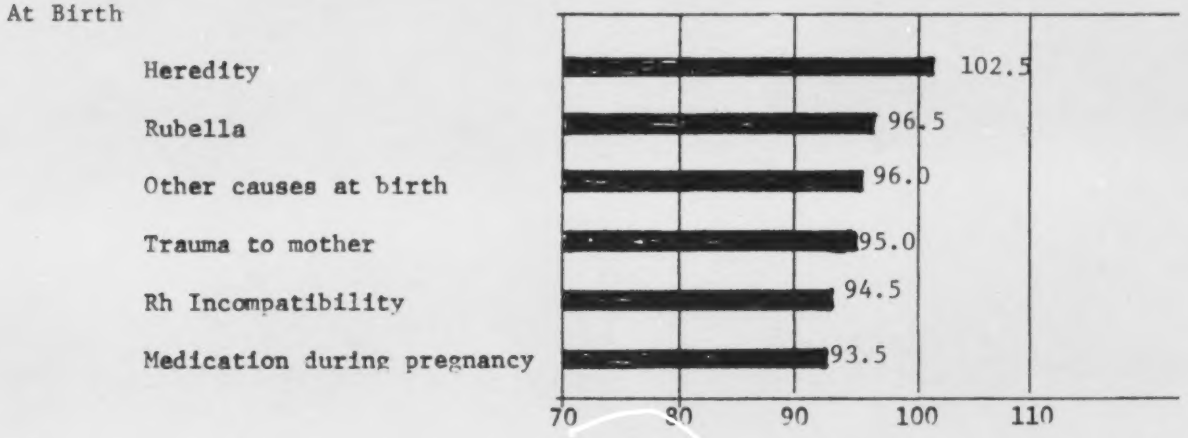
a difference of almost 14 points in the mean nonverbal IQ scores of those hearing impaired students with no additional handicaps and those students with one or more handicaps in addition to their hearing loss. The fact that almost one-third of the hearing impaired students in special education programs are multiply handicapped (Gentile and McCarthy, 1973) takes on added significance in the light of the lower IQ scores of these students.

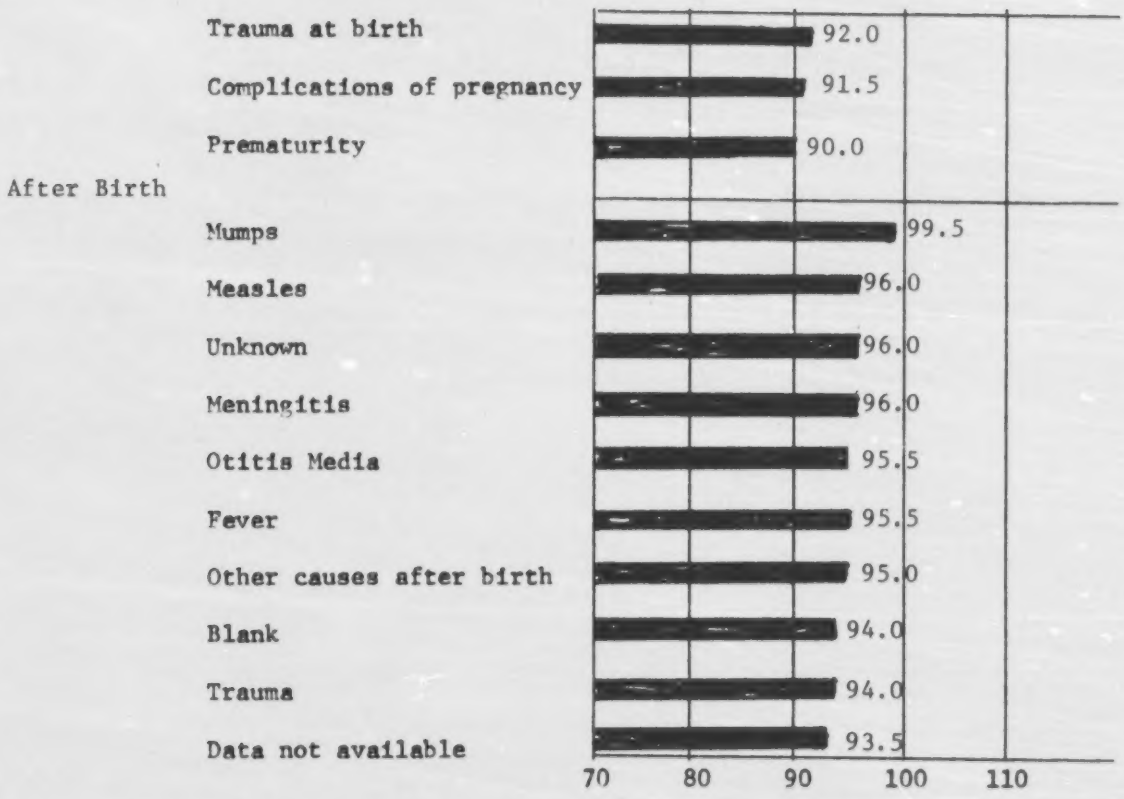
Table 2: Reported Mean Nonverbal IQ Scores of Students Enrolled in Special Educational Programs for the Hearing Impaired According to Additional Handicapping Conditions: 1970-71

Number of Additional Handicapping Conditions	Mean Nonverbal IQ
All Students	95.6
Students with no additional handicapping condition	100.1
Students with at least one additional handicapping condition	86.5

The question of additional handicapping conditions appears again when we consider the relationship of IQ scores to the probable cause of the students' hearing loss in Figure B. The students for whom the cause of their hearing loss was reported as "trauma at birth," "complications of pregnancy," and "prematurity" are the students with the lowest mean nonverbal IQ scores. At the same time, it is precisely these causes of hearing loss that are most often reported in conjunction with the additional handicapping condition of mental retardation (Jensema and Mullins, 1974).

Figure B: Probable Cause and Nonverbal IQ (1970-71)

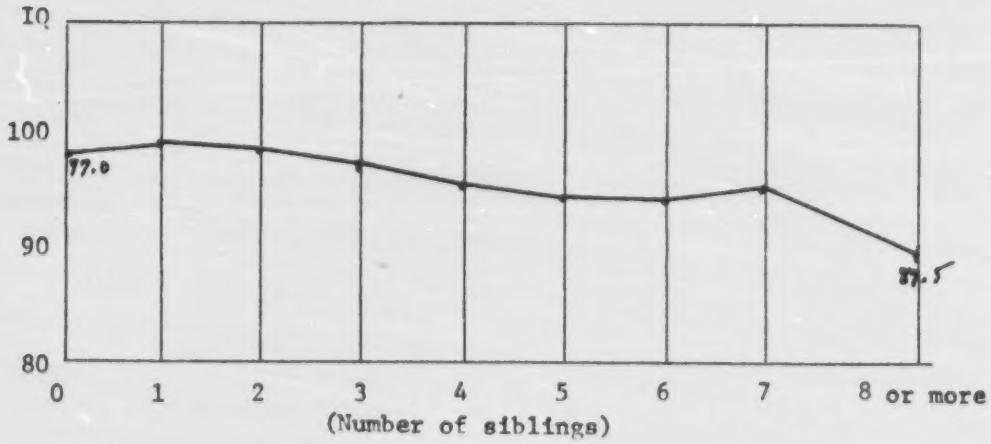




One other observation about Figure B should be made. The highest IQ scores were recorded for the students whose cause of their hearing loss was listed as "hereditary."

The Survey questionnaire also requested from the school information on the brothers and sisters of the hearing impaired student and on the hearing status of the student's parents. Figure C indicates the relationship between the number of siblings the student had and the IQ data. The mean nonverbal score is 97.0

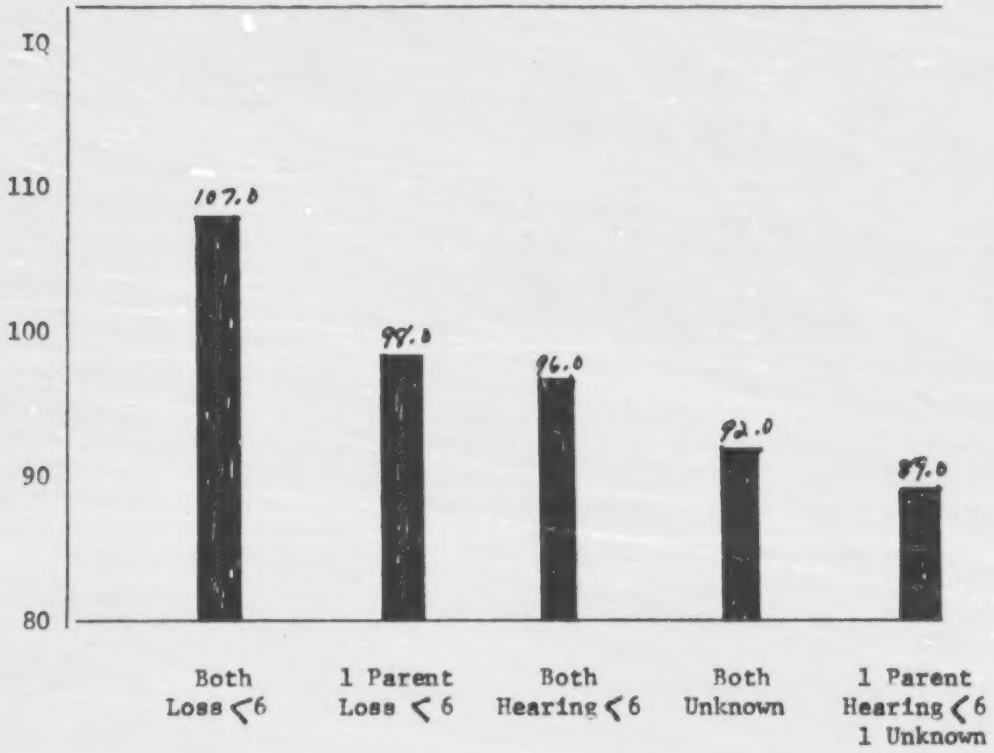
Figure C: Number of Siblings & Nonverbal IQ (1970-71)



for the students with no brothers or sisters; this rises very slightly for the student with only one sibling, then gradually declines until those students with eight or more siblings have a mean nonverbal score of 87.5, over 10 points below those with only one brother or sister.

The relationship between hearing status of the student's parents and the IQ scores is shown in Figure D. It should be noted that the Survey questionnaire asked for the parents' hearing

Figure D: Parental History of Deafness Before Age 6 and Nonverbal IQ (1970-71)



status prior to their having reached age six. The interesting feature of this figure is that the students reported as having both parents with a loss of hearing before age six had a mean IQ of 107.0, while the students with hearing parents -- i.e., hearing prior to age six--had a mean nonverbal IQ of 96.0, an 11 point difference.

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CLASSROOM COMMUNICATION AND ACHIEVEMENT TEST SCORES: A PRELIMINARY REPORT

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Office of Demographic Studies

Background

During 1974 the Office of Demographic Studies (ODS) conducted an extensive program for the purpose of standardizing an achievement test for hearing impaired students and conducting a variety of related research on the achievement of these students. Both achievement and demographic data were obtained on 6,873 students out of the total national stratified random sample of 10,442 hearing impaired students. In addition, information on many details of the student's family and academic background and current environmental situation was sought from the parents and classroom teachers of a random subsample of 1,362 students from this larger sample. Not all students were eligible for achievement testing because of age and other reasons; therefore, the final number of students for whom both achievement data and classroom communication data were available was 697. This report concentrates on these students.

The Nature of the Data

The questionnaires sent to the teachers of the 1,362 students in the subsample included a section in which the teacher was asked to indicate the frequency with which each of seven modes of communication was used in the classroom. The section was repeated twice, once for teacher-to-student communications, the second time for student-to-teacher communications. The seven modes of communication were described as follows:

(1) cued speech;

(2) speech (without cues);

(3) manual signs and fingerspelling;

(4) fingerspelling with no manual signs;

(5) gestures and pantomime;

(6) writing (excluding blackboard), and

(7) other.

Because the point of the study was to describe what actually happens in classrooms, these behavioral descriptions were used rather than such labels as "total communication" and "pure oral" which have significant variations in meaning and have also acquired the emotional overtones of slogans and rallying cries in some quarters. For each method of communication the teacher was asked to indicate the frequency of usage as follows:

(1) never (10% of the time or less);

(2) sometimes (11% to 50% of the time);

(3) usually (51% to 90% of the time, and

(4) always (91% of the time or more).

The achievement data were obtained from the 1973 Stanford Achievement Test, Special Edition for Hearing Impaired Students (SAT-HI), a modification of the original 1973 Stanford Achievement Test (SAT) which was developed by the ODS for use with hearing impaired students. Like the SAT, the SAT-HI consists of six batteries of subject area tests, varying in content and difficulty to cover the range of academic achievement from the first through the ninth grades. For purposes of this study, four subject areas which are included in all six batteries were examined: vocabulary; reading comprehension; mathematics concepts; and mathematics computation. Since raw scores are not comparable from subtest to subtest because of variations in the length, content, and difficulty, raw scores were first converted to scaled scores, which are comparable from level to level within a subject area. These scaled scores were then transformed to percentile ranks within age groups, each age group consisting of students in the subsample who were born in a given year. Missing data (12 out of the possible total 2,788 scores) were assigned percentile ranks of 50, the assumption being that the student with missing data was average in academic ability in that area. These percentile ranks in the four achievement areas were then related to the communication usage scores.

Results

Table 1 shows the reported extent of usage of the various communication methods, both for teacher-to-student and for student-to-teacher communications. Also reported for each method is a mean usage rating obtained by weighting each "never" response as 0, "sometime" as 1, "usually" as 2, and "always" as 3. It is clear that speech is the most frequently used method for both teachers and students and that signs with fingerspelling is the second most frequent method for both groups. The teachers are more communicative overall, with a mean rating for all methods of 0.94, while students have a mean overall rating of 0.81. Students use all methods except gestures to

TABLE 1

EXTENT OF USAGE OF VARIOUS COMMUNICATION METHODS

	FREQUENCY OF USAGE										
	NEVER		SOMETIMES		USUALLY		ALWAYS		TOTAL		MEAN USAGE RATING
	N	%	N	%	N	%	N	%	N	%	
TEACHER TO STUDENT COMMUNICATION MODES											
Cued Speech	630	90	46	6	13	2	8	1	697	100	0.14
Speech	141	20	156	22	76	11	324	46	697	100	1.84
Signs with Fingerspelling	220	32	122	18	99	14	256	37	697	100	1.56
Fingerspelling	343	49	246	35	52	7	56	8	697	100	0.74
Gestures	151	22	429	62	82	12	35	5	697	100	1.00
Writing	274	39	316	45	73	10	34	5	697	100	0.81
Other	557	80	29	4	37	5	74	11	697	100	0.47
									Overall		0.94
STUDENT TO TEACHER COMMUNICATION MODES											
Cued Speech	654	94	32	4	7	1	4	1	697	100	0.08
Speech	175	25	157	22	129	18	236	34	697	100	1.61
Signs with Fingerspelling	199	28	155	22	149	21	194	28	697	100	1.48
Fingerspelling	334	48	276	40	62	9	25	4	697	100	0.68
Gestures	151	22	404	58	108	15	34	5	697	100	1.04
Writing	372	53	286	41	28	4	11	2	697	100	0.54
Other	621	89	17	2	33	5	26	4	697	100	0.23
									Overall		0.81

a lesser extent than do their teachers. It is interesting to note that nearly 10% of the teachers and 6% of their students use cued speech at least occasionally. Particularly striking is the report that 20% of the teachers "never" use speech when communicating with their students. Less surprising is the finding that 25% of the students "never" use speech in communicating with their teachers.

The heart of this study is the relationship between school achievement and the extent of usage of the various communication methods. These results are reported in Table 2. All the correlations are negative, except those for speech, which are consistently positive. Those correlations which were not statistically significant beyond the .01 level are, in general, based upon small numbers of cases. The correlations are of limited size in all cases, but the pattern is completely consistent in demonstrating that higher levels of school achievement and greater amounts of speech usage in the classroom are related.

TABLE 2

CORRELATIONS BETWEEN COMMUNICATION MODES
AND ACADEMIC ACHIEVEMENT TEST PERCENTILE RANK

TEACHER TO STUDENT COMMUNICATION MODES	VOCABULARY	READING COMPREHENSION	MATH CONCEPTS	MATH COMPUTATION
Cued Speech	-.02	-.04	-.02	-.02
Speech	.19**	.25**	.22**	.18**
Signs with Fingerspelling	-.21**	-.26**	-.23**	-.16**
Fingerspelling	-.10*	-.11*	-.05	-.06
Gestures	-.16**	-.27**	-.21**	-.19**
Writing	-.13**	-.12**	-.08*	-.10*
Other	-.09*	-.03	-.06	-.03
R (Multiple Correlation)	.35	.42	.38	.33
R^2 (Proportion of Variance Accounted For)	.12	.18	.14	.11

contd.

TABLE 2 (contd.)

STUDENT TO TEACHER COMMUNICATION MODES	VOCABULARY	READING COMPREHENSION	MATH CONCEPTS	MATH COMPUTATION
Cued Speech	-.01	-.04	-.01	-.01
Speech	.29**	.40**	.35**	.27**
Signs with Fingerspelling	-.24**	-.28**	-.24**	-.15**
Fingerspelling	-.12**	-.13**	-.08*	-.06
Gestures	-.22**	-.36**	-.31**	-.27**
Writing	-.09*	-.09*	-.05	-.05
Other	-.07	-.04	-.06	-.02
R (Multiple Correlation)	.37	.45	.43	.35
R^2 (Proportion of Variance Accounted For)	.14	.20	.18	.12

* Significant at the .01 Level
** Significant at the .001 Level

These data were also subjected to a multiple regression analysis in which the frequencies of usage of the various communication methods were used to predict the achievement precentile ranks of the students. The multiple correlation coefficients are also given in Table 2, as are the R^2 values, the proportion of the variance accounted for. The best prediction was obtained for the reading comprehension subtest, with the multiple correlation accounting for 18% and 20% of the variance. This is quite an impressive amount in light of the other well-known influences on reading achievement, such as the degree of hearing loss of the student.

Table 3 looks in greater detail at the achievement test performance of students who use, and whose teachers use, varying combinations of speech and signing in the classroom. The figures in the table are the mean percentile ranks for all students with the reported combination of speech and signing. The data shown here are for the reading comprehension subtest only, since the figures for the other subtests are very similar and show the same patterns of relationships. It is clear

TABLE 3

MEAN ACHIEVEMENT PERCENTILE RANKS BY METHODS OF COMMUNICATION:
READING COMPREHENSION SUBTEST

A. TEACHER TO STUDENT

		NEVER	SOMETIMES	USUALLY	ALWAYS	SIGNS MEANS
SIGNS	Never	50	47	52	70	64
	Sometimes	37	37	61	49	45
	Usually	51	39	46	40	42
	Always	39	47	43	48	45
	Speech Means	42	42	53	58	50

B. STUDENT TO TEACHER

SIGNS	Never	41	51	52	73	67
	Sometimes	32	33	48	57	43
	Usually	40	44	48	58	45
	Always	37	47	51	50	44
	Speech Means	37	42	50	66	50

that those students using "speech always, signing never" have the highest mean percentile rank, while those using "signing always, speech never" are among the lowest in achievement test score percentile rank. Furthermore, the overall mean percentile ranks for the various degrees of usage of those two predominant methods show that, regardless of the amount of signing used, higher achievement scores are related to higher amounts of usage of speech. Also, regardless of the amount of speech used, those who "never" use signing show consistently higher achievement scores than those who use some signing.

Discussion

The data presented here indicate clearly that there is a limited but significant degree of positive association between usage of speech in the classroom and school achievement test scores, and that there is a limited but significant negative association between the use of signing in the classroom and school achievement test scores. All other communication methods also show negative associations with school achievement.

At this preliminary stage of analysis of these challenging data, it is well to sound two words of caution. First, it should be emphasized that the associations reported are general trends. We are now looking closely at the associations as a function of various demographic characteristics, such as degree of hearing loss, ethnic background, and type of educational program. Our current analyses suggest that it is of utmost importance to consider such variables before an adequate interpretation of these data can be made. Second, it is important to remember that correlation between two variables indicated association only, and cannot be used to prove any causal implications. For the present data, it may be that greater usage of speech and less usage of signing in the classroom actually lead to or produce higher levels of school achievement. However, it is equally possible to suppose that higher levels of school achievement lead to greater degrees of speech usage and lesser degrees of signing on the part of students and teachers. Perhaps those students who do well in school, therefore, feel more encouraged to develop their speech abilities; and perhaps teachers are more inclined to use speech with those students who seem brightest and who are doing best in school. Or perhaps some one or several other variables not considered in this analysis are the key factors leading to both higher achievement and higher amounts of usage of speech in the classroom.

The challenge present in these data is clearly very great. The more detailed examinations of these results that are now under way should shed further light upon the meanings and relationships present here.

A DEAF COLLEGE STUDENT'S EDUCATIONAL EXPERIENCES

Martha Sheridan
Gallaudet Student

I was the second of four children born to hearing parents. My older brother is hearing, my younger sister is also hearing but my younger brother has a moderate hearing loss due to spinal meningitis. My hearing loss was not noticed until I was approximately four years old. The cause is nerve deafness which may have been caused by a severe case of measles that affected my inner ear, although there may have been other unknown factors contributing to my deafness.

At five years of age I started kindergarden. One day, when I had a bad cold, my mother wrote a note to my teacher telling her that I had a cold and that I obviously couldn't hear as well. My teacher wrote back and said that she had noticed something was wrong but she couldn't figure out what it was. My parents decided to take me to an ear specialist. He tested my hearing and discovered that I had a moderate hearing loss. When my mother asked him what should be done about school, he said that I only needed a front seat and I would be all right.The doctor did an exploratory operation on my ear and found adhesions in my inner ear. He removed the adhesions thinking that my hearing would be cured, but he was wrong.

I continued in the hearing school. I failed the first grade, went to summer school and passed on to the second grade. Yet, my grades were bad. I did very poorly on up to the fifth grade when, finally, they flunked me. All through these first five years in school I knew that I was different from the other students in my class, and my classmates knew it also. I was treated differently, that was how I knew. I was too young to understand the reason. The kids didn't seem to like me, somehow I just couldn't get into the games and things that they were doing, and when I did, I often did the wrong thing. The kids thought I was stupid and the grades on my papers showed that. I had a sense of inferiority, because no one wanted to be my partner in line, I never got stars on my papers, and because I didn't get to go bowling with the kids that got A's on their spelling tests.

I transferred to a private parochial school and repeated the fifth grade. To my surprise, I started getting all A's and B's. I was no longer the dumbest kid in the class, but one of the smartest! My sense of inferiority disappeared in some ways but remained in others. I still was not the least bit popular, I knew and despised that, but I couldn't figure out why. I was confused! I was depressed much of the time. When I compared myself to others, I couldn't understand why people liked them so much better and why they had so many more friends. Sometimes there were kids that I really admired and made an effort to be friends with, but they would obviously brush me aside. I would be hurt and cried often and felt sorry for myself.

I'll never forget an experience I had in the sixth grade. We were studying Ancient History and I was sitting in the front row, one seat to the right of the teacher's desk. The teacher called on me to answer a question that I didn't know the answer. As a rule, we were supposed to stand up when we were called on. Obediently, I stood up, and thought for a moment, searching my mind for the answer. I didn't know the answer and told the teacher so. She called upon another boy for the answer and I took my seat. The boy knew the answer and the teacher looked over to me and asked me to repeat what he had said. I hadn't heard him and again I couldn't answer her. She yelled at me for sitting down and said that I should have remained standing until he finished answering. She ordered me to stand up again and to listen to him repeat the answer for me. He repeated it but I still couldn't understand him. She told him to say it again. I tried, nervously, embarrassed, and humiliated to read his answer off of his lips and failed again and again. The class was giggling and I giggled with them trying to hide my embarrassment. Finally, she called on another boy to tell me the answer. This boy had large buck teeth that hid his lower lip and made it impossible to lipread. I could feel a huge lump developing in my throat and my face was getting redder and hotter. Before long, my eyes were so full of tears that I couldn't even see the boy. I tried hard to control myself but couldn't. Finally, after what seemed a whole hour, the teacher told me to go to the restroom and hide my face. I did and stayed in there alone and afraid sobbing until one of the girls was sent by the teacher to come and tell me to return to the classroom. I cried the rest of the day.

Another experience I had in that school under the same teacher was this. During the afternoon Physical Education period, the girls in my class were playing a game of "Dodge Ball," or "Goal Guard." While we were playing, the girls kept calling my name from behind, and when I heard them and turned around, they would act as if no one had called me. They kept doing this, and I started to pretend I didn't hear them but they called louder and louder. I was mad and turned around and asked them to stop it, but they only laughed and said "Stop what?" and continued. I left them because I started to cry and didn't want them to see me. I went back to the classroom, thinking I would be alone there but the teacher was there. She saw me crying and asked me what was wrong. I explained with a shaky voice what had happened. Furiously, she went out on the playground and asked the girls if what I had said was true. They denied that they had done that and accused me of lying. The teacher obviously believed them. That afternoon, leaving school in line, I heard someone yell something at me from behind. A girl, that I walked home with, told me that one of the girls yelled "What are you bringing your Science book home for Deafie?" and everyone laughed.

As for speech training or lip reading, well, the public school that I attended in the second, third, fourth, and fifth grades has a special speech program. I was referred to that, and if I remember right, I think it was a 45 minute period once a week. During that period, a speech therapist worked with me on lip reading and the "S" sound with which I had difficulty and still today cannot master. I got my first hearing aid when I was in the third grade. I was completely dependent on my hearing aid and would't go anywhere without it.

I can remember from approximately age five having ringing in my ears. By the time I was in junior high school, I began complaining of frequent dizzy spells also. There were especially frequent in hot weather. When I was 15 years old, I entered high school. On the first day of classes in my freshman year, I was very nervous about going to high school. I depended on my mother or younger sister to wake me in the morning since I couldn't hear the alarm. That morning my mother woke me. I went down the stairs from my room and into the bathroom to get washed up and ready for school. I fainted. When I came to, I could remember having intense, almost unbearable ringing in my ears, and my head felt like it was spinning around in circles at 200 miles an hour. I vomited heavily. My mother and brother carried me to the couch. I was sick and too dizzy to walk for three days. This scared my parents. They took me to a doctor at Children's Hospital in Columbus, Ohio to see if anything was wrong. The doctor suspected that I had Meniere's Disease. He suggested that I stay in the hospital for a few days for tests. They tested me for Meniere's Disease, a possible tumor, brain damage, and epilepsy, and found nothing. I was frightened of doctors and hospitals and anything pertaining to them. Not knowing what they were going to do to me scared me even more. The first morning of my stay, they woke me and took me down to the X-ray Room for X-rays. I didn't know what was going on. They gave me a small cup of medicine to drink. I drank it. All the machines and patients I saw in the room frightened me and I had another one of those attacks. This time it was worse, and I screamed as I was coming to, because the head noises and spinning were so intense. What was supposed to be a two day visit turned out to last for a week and nothing was accomplished. They still can't explain why I had those. It has not happened since I entered college. That makes me suspect it was nerves.

During my freshman year in high school, my hearing dropped 20 decibels. I did make some friends, but I was still lonely. The friends I made were also "rejects." They were mostly slow learners and kids that I really had nothing in common with. I tried out for cheerleading and failed. There were other things I wanted to try out for, like Drama and Student Government, but I knew I didn't stand a chance because I couldn't hear. But there was one organization that I wanted to belong to and knew I would make it. That was the Girl's Precision Dance Drill Team. I tried out for that, and much to my happiness and satisfaction, I made the team. It's interesting what happened at tryouts. Eighty-seven girls were trying out, and four girls at a time had to perform the required routines for the judges. My number was 57, so I had to wait quite a while for my turn. While I was waiting, my hearing aid battery slowly died out. I became panicky because I depended on it so much and wanted more than anything to make that team. I told the captain what had happened and she explained the situation to the director and the judges. They

told me to go ahead and try out. When it was my turn, the commander surprised me by holding up cards with the commands on them, such as left face, right face, to the rear march and halt. I was relieved and regained my confidence. Holding up the cards as she yelled the commands, I followed her lips and performed without any mistakes. I was very grateful to her and made the team. This proved to be a rewarding experience for me. It provided me a means of physical exercise and was good for me mentally, also, because I enjoyed it so much. It filled up a lot of emptiness in my social life and prevented me from just sitting around feeling lonely and sorry for myself. I wanted to be a part of my high school and to be just like everyone else, and that gave me those feelings. Also, I loved to dance and to entertain, and drill team gave me that opportunity. It was a kind of therapy for me. I loved it and did well at it. At the end of my first year, I was awarded the trophy for "The Most Improved Member" and became an officer. My third year I was named "Miss Buckeye State Drill Team" and received the "Highest Kicking Member" award. That really made my life in high school.

I had very few dates during those years. The reason for that was because I couldn't communicate with anyone, especially boys. I was asked to parties, but I rarely went to them because I never enjoyed just sitting and watching everybody, and not understanding what was going on. Most of the time nearly everyone had dates to the parties but me, and that was embarrassing too. As a result of this social isolation, I got very far behind my hearing peers in current events and facts of life. Needing friends, and someone to communicate with drew me deeper and deeper into my religious life and relationship to God in prayer. I prayed every night and just talked to God like He was the only person who cared, understood, and accepted me. Because I was so behind and naive, and didn't go to the parties, and didn't use swear words because I didn't know what they meant, and was embarrassed to ask anyone, everyone thought I was a "goodie-goodie" or a "Mommy's girl."

My favorite course in high school was English, and I loved to write poems and short stories, and I did well in them. I think the reason why I was so good at that was because I had so much time to sit around and think on weekends, while other kids were out having good times. My high school was on a College Preparatory program and used an innovative experimental system. We didn't have study halls and used our free time the way we felt was best for us. This helped us to develop a sense of responsibility in using our time and in our school work. I used all of mine in an empty classroom or in the library away from everyone else studying, or pretending to be, by writing letters or poems, when I didn't have anything to study. That was a withdrawal. Many times I would use my free time to meet with my teachers to discuss what I didn't understand in class. That arrangement was especially helpful in Latin, which I didn't understand at all, and suspect that my teacher passed me with a "C" out of sympathy when I really should

have failed. The same thing happened in a Japanese History course that I signed up for on a special individual basis with my teacher. Well, this teacher, a student teacher from Ohio State University had no responsibility, and never showed up at the appointed time. I looked for him often and he always had an excuse. At the end of the trimester we had only met one time. I was angry and when I found him and asked him what he was going to do about my credit he said "Oh, I'll just give you a 99!" I was angry, I said "Wow, I don't want a 99 because you never taught me anything, I never took the course." He said "Don't worry, I'll just give you a 99," and walked off. When I got my report card, sure enough, I got a 99. How immature, sympathetic and naive can they get?

In other courses I did well and know that I spent more time studying than other students did. That was necessary since I had to depend totally on other students' notes and the textbook.

I had a hard time understanding my teachers. Even when I sat in the front seat. Too often they talked with their face to the blackboard, or went to the back of the room to lecture, or talked with hands over their mouth, or pens between their teeth, or had long shaggy mustaches and beards making it impossible to lipread. Even when I was lucky enough to have a clear slow speaking and understanding teacher, a deaf student can't see more than approximately 25-35% of what is being said on the teacher's lips. So being profoundly deaf, I was lost in a hearing school.

Well, by the time I was a sophomore in high school, I started thinking about what I would do after I graduated. I wanted, definitely, to go to college and further my education. Since junior high school I had an inner desire to work with the deaf. I guess that was because I knew I could identify with them. This desire stayed on strong and I knew I needed to go to college to accomplish that. A lot of my classmates were considering college also, but they were considering large hearing universities, and majors like Broadcasting, Pharmacy, Public Relations, etc. I knew that I couldn't major in anything of the kind at a big hearing university and I was only interested in the field of deafness. I honestly didn't want to go to Ohio State University, where everyone else was going. I didn't know where I wanted to go. Then I began wondering if there was a college for the deaf, or a college that had a program for deaf students. I had never heard of one and doubted if there was. The guidance counselor at school was of no help at all. He didn't know any more about it than I did. I asked my Mother if she knew of a college for the deaf. She said that she had seen a group of deaf dancers (the Gallaudet Dancers) on the Mike Douglas Show one afternoon, and recalled that they were from a college specifically for the deaf, but she didn't know the name of the college, or where it was. Not too long after that, I went to have my hearing tested by my audiologist, who was also my speech conservation therapist. She said that she would like to

see me go to Gallaudet College in Washington, D.C. I asked her what type of college was that, and she explained to me about the college. She gave me the address, and I started sending for information on the college. My Audiologist also informed us about Vocational Rehabilitation, and the opportunities available through it.

I took the ACT (American College Testing) college entrance examination at Ohio State University my senior year. My scores were low compared to my hearing peers and I was deeply hurt, fearing that I would not be able to attend college. When I went to take the test, the people giving the test almost refused to let me take it, because of my deafness, but I kept insisting, feeling discriminated against, and finally they gave it to me. Not long after I received the results of the test, I got a letter from the ACT headquarters saying that they would give me an opportunity to take the test over again under the supervision of my school counselor. They said that the test was not fair to me because it was a test made for hearing students and I took it with them, timed. Before I could reply to that letter, I received a letter of acceptance into the freshman class at Gallaudet. The letter said that their decision was based on my ACT English scores which were good. I was thrilled!

My Vocational Rehabilitation Counselor, a 1972 graduate of Gallaudet College, suggested that I try to learn signs before I go to Gallaudet. That suggestion was very welcome because I had always wanted to learn signs. I learned the manual alphabet from the World Book Encyclopedia when I was 13 years old and practiced it alone often. Sometimes I even fingerspell my prayers. My V.R. Counselor found an instructor for me. My instructor, whose parents were deaf, was a certified interpreter, and interpreted for deaf students at Columbus Technical Institute. I had lessons in beginning signs twice a week for six weeks in the summer before I left for Gallaudet.

My first day at Gallaudet was probably the most exciting day in my life. I arrived there full of confidence and hope for a bright future. I knew that at Gallaudet I would have friends and dates. I would be accepted and understood. I could communicate and, thus, would get the education I was seeking. All of those things happened, but not without frustration. I did have a hard time understanding signs and becoming adjusted to the deaf. At first, a lot of the deaf at Gallaudet thought I was hearing because my personality was molded in a hearing world, my speech was another factor that made them think I was hearing - the third factor was the way I signed. I signed and spoke perfect English like a hearing person would. In order to be accepted by the deaf at Gallaudet, I had to change my language from straight English into Ameslan, and stop using my voice with them. I learned that there

is a sort of friction between the two types of deaf people, Oralists (those who went to Oral or hearing schools and speak), and Manualists (those who went to deaf residential schools where signs were used or who come from deaf families using signs). The Manualists made up the majority of Gallaudet and, if I really wanted to be a part of Gallaudet, I had to learn their language, and use it faithfully. That I was willing to do!

During my first year at Gally, I had a lot of catching up to do. During bull sessions in the dorms or the Rathskellar, we discussed topics including drugs, sex, marijuana, abortion, birth control, drinking, dating, the opposite sex, religion, etc. Many times I found myself not understanding a lot of terms my deaf friends were using and had to ask them what they meant. Many of the things I was learning in college were things that most hearing adolescents discuss and know in junior high school. I was amazed at how behind I was, very thankful for the opportunity to know signs, and learn these things. Without signs I still wouldn't know most of these facts today at 21 years of age.

I've never been happier in my life as I am at Gallaudet with the deaf. It's really made up for everything I missed out in the hearing school. I've got the social life, the learning environment, the fun and good times and, most of all, the rich and deep expressive and receptive communication that I always wanted and needed.

When I went home for Christmas vacation after one semester at Gallaudet, I was so full of excitement. I had so many stories and experiences to share with my family. I loved it at Gally, and told my family that I knew that I had learned more in one semester at Gallaudet than I did in four years in a hearing high school. I knew that I had made the right decision about college. Another thing that shows what Gallaudet and sign language have done for me can be illustrated in the statement made by my mother, and by a few other people at Gallaudet after one year here. "You left home a girl, and came back a woman."

I wouldn't trade my hands now for anything in the world!

THE GREAT METHODOLOGICAL CONTROVERSY AND THE DEAF IMAGE

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The history of the education of the deaf can be characterized by two centuries of controversy about methods of instruction. During that time, method after method has come to the foreground, later to fall out of favor among the educators, and ultimately to be replaced by another approach. A substantial part of the literature devoted to the education of the deaf is taken up by descriptions and criticisms of various methods of instruction. At different places and different times, the same methods have even recurred. For example, total communication, mainstreaming, the combined method, invented sign systems, pure oralism, the Rochester Method, and Cued Speech have all had similar predecessors in the history of deaf education.

The popularity of any specific method cannot be explained in terms of objective results. This kind of data is either not available, or else it is ignored when proponents of a particular method argue in favor of their approach. Bernard Mottez, a French sociologist who is interested in the way society views problems, such as alcholism and handicaps, suggests in a manuscript that a comparison of results may not be meaningful because each method has its own objectives.

Mottez also suggests that the controversy of methods should be viewed as a conflict about objectives and the place deaf people occupy in society. Professionals in the field of deafness maintain certain views of their students or clients; according to Mottez, educational goals are based on this "deaf image." Examination of the deaf image, and the alteration to which it is subject, can provide important insights into the choice of methods, and explanations for changes that occur in methodology. Using the above as a hypothesis, Mottez explains why and how the method of instruction based on sign language invented by the Abbé de l'Epée was replaced by oral instruction late in the 19th century, in all the French schools for the deaf.

De l'Epée's system of methodical signs was intended to code visually all aspects of the grammar and vocabulary of the French language. The sign vocabulary used by deaf people in their own sign language - French Sign Language (FSL) - was incorporated in the new system in which they correspond to French words. In this way, a one to one relationship was established between, on the one hand, the structure and vocabulary of French, and on the other, visual symbols made in the air with the hands, face, and body.

De l'Epée believed that the sign language used by his students among themselves was their native language, the only one they could ever have (1776). His objectives were to provide his students the means

for intellectual and spiritual growth. In agreement with the prevailing philosophical outlook in France at that time, he thought that a visual symbolic system could represent ideas as well as a system of acoustic symbols (Seigel 1969). However, being a priest and a Frenchman, he perceived the need to expose his students to the teachings of the Church and to the benefits of French culture. He was convinced that this kind of education required knowledge of the French language. He, therefore, invented his methodical signs to teach French to his deaf students.

It is noteworthy that de l'Epée did not expect his students to achieve perfect mastery of the French language, even in its written form. He thought that deaf people could know French in the same way hearing people often know a foreign language, namely, well enough to read and understand, but not well enough to speak or write it correctly. De l'Epée stressed this point to his disciples by reminding them that their concern should be the intellectual and moral development of their students, not their ability to express themselves in French (De Gerando 1827).

De l'Epée held public demonstrations to publicize and propagate his method of instruction. These demonstrations were designed to show that his students, although deaf, were capable of acquiring the intellectual and spiritual qualities that are the symbols of the educated person in France. De l'Epée's contemporaries, particularly the elite of Paris - the intellectuals, the Church and Court dignitaries, and foreign royalty - attended these sessions in large numbers. The educated deaf had a very positive public image, although most of the students came from poor families because de l'Epée did not care to instruct the children of the wealthy who could afford private tutors. Sicard, de l'Epée's successor as the head of the Paris Institute for the Deaf, continued the practice of holding public demonstrations, even when he was forced to take temporary political asylum in England. He was accompanied by two of the Institute's most brilliant students - Massieu and Clerc. It was in London that T. H. Gallaudet met Sicard and was invited to learn the method of instructing the deaf based on methodical signs (Peet 1858).

Although education was limited to only a small minority of the deaf at the end of the 18th century and the first half of the 19th, many of the Institute's students achieved recognition in their professional fields. They included teachers, administrators, writers, poets, and artists. Massieu and Clerc both became teachers at the Institute. Clerc is remembered even today for the crucial role in the establishment of education for the deaf in America. Berthier, also an outstanding student, became the dean of teachers at the Institute and a brilliant writer. Another former student, Pelissier, acquired a national reputation as a poet who is still read today.

In view of this success, the switch to oralism, which occured in France and in other European countries late in the 19th century, is incomprehensible, unless one takes into account the modification of the deaf image. Since the beginning of deaf education, even in de l'Epée's time, there were educators in France who held a totally different image from that of the majority. In their eyes, the deaf were not the intelligent students exhibited by de l'Epée but, on the contrary, intellectually and morally inferior beings. Academic education would be wasted on them; the only worthwhile thing to teach them was how to talk. Their basic belief was that all deaf people can learn to talk.

By the time of the International Congress of the Educators of the Deaf which was held in Milan in 1880, this point of view prevailed among European educators. The delegations from the European countries had carefully eliminated deaf teachers from this congress (personal communication from René Bernard, librarian at the Paris Institute). An incident described in the proceedings of this congress serves to illustrate the attitudes of the two factions. The delegates were invited to visit a school for the deaf in which one of the students, selected for his good oral skills, proclaimed that a deaf person who cannot talk is like a monkey. E. M. Gallaudet, whose mother was deaf, took strong offense at this statement. In his address to the congress, he stated that his elderly mother was a saint, although she had never used her voice.

In spite of the opposition of the minority, including Gallaudet, who favored the continued use of sign language. The Congress of Milan proclaimed the superiority of oral instruction. In a second vote, the delegates eliminated sign language from the schools (Mottez).

The congress concluded with the shouting of the oralists' new slogan: "Vive la parole!" (Long live speech!) A rejoinder to this slogan was not long to follow from deaf people themselves: "Et a mort aux sourds muets!" (And death to the deaf mutes!) In France, the resolutions passed by the Congress of Milan had the effect of an edict - all of deaf education became oral, and it is still the case today (Mottez). By 1887 all of the deaf teachers had been dismissed and none has been hired since that time in any French school for the deaf (personal communication from A. Blanc, psychologist at the Paris Institute).

The Congress of Milan marked a new stage in deaf education; the educators had made a complete about face in their approach to teaching deaf children. However, the switch in methods did not occur until after a new negative attitude towards deaf people had become widespread among the teachers.

The present attempts to teach English to deaf children by means of invented sign systems - SEE I, SEE II, LOVE, Signed English, and the Paget-Gorman Sign System - bear a striking resemblance to the

system of methodical signs devised by l'Abbe de l'Epée to teach French to his students. These current sign systems are based on the principle first invented by de l'Epée: they attempt to represent a spoken language by means of a visual code. Also, like de l'Epée's system of methodical signs, they incorporate the sign vocabulary already in use in the deaf community.

It is surprising that the inventors of new signs do not acknowledge the similarity between their systems and that of earlier educators of the deaf. Methodical signs were not limited to teaching French; Gallaudet and Clerc adapted them to teach English in this country. They were used at the American Asylum in Hartford, Connecticut, from the time it was founded in 1817 until 1835. Other American schools continued teaching with methodical signs even after they were abandoned by the Hartford School. For several decades their use was a controversial issue, which was debated in many papers published in the American Annals of the Deaf and presented at the conventions of the American Instructors of the Deaf between the late 1840's to 1880. During that period, signing in the order of English was also advocated by some educators as an alternative to signing the "natural" way. More recently, the Paget-Gorman Sign System has been in use in Great Britain where it was invented 40 years ago.

There is an important difference between what the modern educators are attempting to do with their sign systems and what their historical precursors were doing. De l'Epée's goal was to have students learn French as a foreign language so that they could have access to the French culture and the teachings of the Church, thereby developing their minds and souls. That goal was achieved by his students and that of his successors. Today, the acquisition of competence in English is the rationale for the use of invented sign systems. This goal is much more ambitious than de l'Epée's objective for his own students, and the expected results may not be achieved.

When the oralists were faced with the poor results of their approach, they could have chosen to reexamine their method or their goals. They chose instead to blame the gap between what they expected and the actual results on the deaf children's innate inferiority. Thus, the oralists' method eventually served to reinforce their negative image of the deaf.

Although rising in popularity, invented sign systems face serious difficulties as far as achieving their goals is concerned. Some problems may be due to defects in the systems themselves. Others may result from outside causes - for example, very few teachers and parents can use systems fluently and efficiently. In addition, it is likely that because of their inherent complexity, spoken languages do not lend themselves to visual representations. A consequence of the present popularity of invented sign systems may be a future devaluation of the deaf image.

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SOME PRACTICAL ASPECTS OF RESEARCH IN LANGUAGE AND COMMUNICATION: NEEDED RESEARCH THROUGH INSTRUCTIONAL MATERIALS DEVELOPMENT

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Introduction

The Instructional Materials Research and Development Center of the Office of Educational Technology is charged with, among other things, facilitating and supporting the development of instructional materials appropriate to and valid for hearing-impaired and deaf learners. Two phases of the facilitating and support effort are projects done during the academic year, and the summer materials development grants funded through the office of the Dean.

In the past five years, over 70 instructional materials development projects have been undertaken involving faculty and students from 15 instructional departments. In addition, projects have been, and are, on-going, with such diverse campus organizations as the Law Center, the Center for Continuing Education, Edward Miner Gallaudet Memorial Library, and the Tutorial Center. These projects involve a wide range of instructional materials and media, and a variety of media mixes for differing instructional purposes.

A backward look over past projects, and a forward look over anticipated projects, indicate a need for research aimed at generating a data base for materials development. This is a most practical kind of need: a need for data from past materials development experiences to serve as guidelines for future development work. The purpose of this presentation is to briefly outline three broad areas in which, at this point, research seems to be needed.

I. Research Into the Learning Process as Experienced by Deaf Learners Via Instructional Materials and Media.

The area I wish to describe briefly is the need for research into the learning process as experienced by deaf learners through a variety of media and materials. We find ourselves in the position of having the potential benefit of a vast body of research literature on instructional materials and media. What we do not seem to know clearly is the degree to which deaf learners receive and respond to educational communications in manners and modes suggested by non-deaf research subjects over several generations. Using fairly traditional approaches to instructional communications and technology research, at least four areas of needs are evident related to research into the learning process.

First, we need to identify, describe, and specify the differential impact of relevant antecedent conditions to instruction with deaf learners. Antecedent conditions are taken here to mean those conditions which exist

prior to instruction which may relate to outcomes. A number of possible research questions suggest themselves. Some examples are: Which kinds and qualities of deaf learners' experiences form a basis for learning language and subject area content? Which attitudes, values, and motivational attributes do deaf learners possess, and how are they expressed? Are there experimental or attitudinal advance organizers that can be tapped and built upon in instructional sequences in college level programs? Which personal needs are perceived by learners as critical to their academic experience and germane to their success and well-being? What characteristics exhibited by deaf or hearing teachers, or the formal teaching process, match and don't match the needs and characteristics of deaf learners? Which subject areas, formal academic experiences, and informal college life experiences are most relavent and most supportive to both the short-term personal and longer-term academic needs and interests of deaf learners?

Second, we need to isolate, describe, and analyze the nature of instructional transactions among deaf students, their teachers, and assemblages of materials and equipment. In this case, transactions are taken to mean the verbal and non-verbal content of and way in which students interact with each other and their teachers, and possible variations in implementation of given techniques, materials, or equipment. Again, many questions suggest themselves, some examples of which are: Which particular strategies, techniques, or methodologies are appropriate for deaf learners and their teachers? Do certain kinds of instructional strategies produce predictable kinds or qualities of instructional transactions? What transpires among learners and teachers during various types of instructional transactions in terms of language, motions, content-related ideas, and the affect? What are the sources of interference to task-related communication during instructional transactions from both students and teachers? Which forms of classroom organization, interpersonal interaction or communication levels may be associated with or appropriate to preselected kinds and qualities of instructional transactions? How are the cues for initiation, maintenance, or termination of an instructional transaction transmitted, perceived, and interpreted? What is the duration, intensity, or frequency of various types and qualities of instructional transactions?

Third, we need to establish data about the range and nature of instructional outcomes possible with deaf learners. Among the research questions we might ask here are: How are outcomes specified for and demonstrated by learners? Is there any difference between subjective and objective assessment of outcome attainment? Are given instructional procedures relatable to predictable levels of achievement? What are student attitudes and emotional reactions to given instructional outcomes? Are certain instructional routes more productive than others if the outcome is intended to be such higher cognitive processes as critical thinking, higher level questioning, and concept learning? What are the relevant reinforcers for deaf learners once pre-determined outcomes

have been achieved? Are there possible procedures for establishing reliability and validity for non-pencil-paper outcome measures?

Fourth, we need to test and document with deaf learners some of the time-honored principles of media utilization. For example, we can make with a high degree of certainty the following statements about instructional television:

> (1) Where learning of perceptual-motor skills is required, a subjective angle presentation on television will tend to be more effective than an objective angle presentation;
> (2) There is insufficient evidence to suggest that dramatic presentation will result in more learning than will expository presentation in instructional television;
> (3) Students taught by television tend to miss the personal teacher-student contact, but there is insufficient evidence to suggest that the lack of such contact will impair learning from instructional television;
> (4) Note-taking while viewing instructional television is likely to interfere with learning if time for it is not provided in the telecast, and
> (5) Liking instructional television is not always correlated with learning from it.

We could make the same kinds of statements, derived from research on programmed instruction, film, multi-image presentations, and multi-media presentations. But we do not know at all that these general kinds of principles are valid and applicable to the use of any of the above media with deaf learners. Until we have established data derived from our own developmental use of these media, we will be operating upon assumptions and un-tested principles.

II. Formative and Summative Evaluation in Instructional Materials Development.

The use of evaluation techniques to determine the results or effectiveness of instructional materials development efforts has, too often, been overlooked on this campus and in many other colleges across the country. This situation is truly unfortunate, for it is from the results of evaluation that research questions are answered and from which further research questions arise.

Basically, there are two kinds of evaluation, formative and summative. For the purpose of instructional materials development, formative evaluation is the systematic collection of data in order to evaluate learning materials while they are being developed. Let us emphasize that the purpose of this data collection is to determine the effectiveness of the materials, it is not an evaluation of the student nor of the teacher.

There are several ways in which formative evaluation data can be collected. In the area of cognitive learning, the usual method is for the teacher to sit down with one student for whom the material is intended, and

to let the student use the materials "out loud." The student is encouraged to think out loud, to make comments to the instructor as he goes through the learning material, and/or, if possible, to write his comments on the materials themselves. Based on the student's comments, a teacher can detect weaknesses in the materials, as for example, difficult words, unclear passages in the text, lack of logic, or gaps in explanations. Revisions can be made in the materials accordingly. After revising his materials, the instructor can try them out with another student or a small group of students to see if the weak spots have been strengthened. This process may go on several times before the materials are satisfactory.

It is also desirable to obtain some formative evaluation information on the affective appeal of the materials. Through use of a questionnaire or interview, the teacher can determine if the student liked the materials, if they were interesting or boring, too hard or too easy, too long, or just right. By watching the student's body language and facial expressions while he uses the learning materials, the teacher can obtain affective information almost without the student knowing it. Again, revisions can be made to add interest, shorten lengthy materials, or to make whatever other changes seem necessary.

The important thing to remember about the formative evaluation of instructional materials is that it is just that - an evaluation of the materials: do they teach what you want them to teach?

The second type of evaluation is what most of us already do in our teaching, and is called summative evaluation. This evaluation usually comes at the end of a unit, semester, or course, and tries to determine how much the students have learned during that period of time. Data is collected which reflects the students' learning and is most often used for grading purposes.

The most common form of summative evaluation is the unit test, the mid-term, or final exam. But there are other kinds of useful data with which to evaluate the effectiveness of a course. Some examples are:

(1) How many books related to your course have students checked out of the library?
(2) How many times were your video tapes used by the students in your class?
(3) Did your students bring their books to class?
(4) Did your students seem to use their books (that is, did they underline things, answer the practice questions, write in the margins?)?
(5) Were your students active participants in class discussions?

In the area of affective appeal of an overall course, questionnaires can be given to students to determine if they liked the course, if they would voluntarily choose another course in the same field, if they enjoyed

using video tapes (or other materials), if they thought they learned better from video tapes (or other materials), or what part of your course they liked most/least.

By asking questions such as those given here as examples in both the cognitive and affective aspects of formative and summative evaluation, the instructor puts himself in a position to ask and answer some important questions related to our deaf learners. Some of these questions might be:

(1) Do deaf students prefer one medium (TV, slides, textbook) to another?
(2) Do deaf students learn better using one medium or another?
(3) Does simplifying the language structures used in teaching/learning materials result in better learning for deaf students?
(4) What factors in learning materials appear to motivate deaf students to study more and learn better?

These and other questions important to our students here at Gallaudet College can only be answered adequately by systematically collecting formative and summative evaluation data in some of the ways just discussed.

III. Validation and Cost/Benefits Analysis of the Development Effort.

Usually persons who have developed instructional materials of any kind are anxious to see if the materials do what they are supposed to do. Validation is the process of trying out the materials which have been developed on a group of students or individuals similar to those for whom the materials are intended. In the past, especially when materials have been developed during the summer at Gallaudet, it has not been possible to find subjects who could and would try them out. Consequently, the materials were tried out in a regular classroom situation. However, because of the pressures of classroom responsibilities, meetings, and numerous other distractions, collecting data on student performance and following through with revisions became a seemingly impossible task, easily pushed aside and forgotten. There has been little validation data collected, and none published. In four courses developed through the summer grants program, revisions have been made based on data obtained from a validation process.

Validation is one kind of formative evaluation. Most authorities on evaluation agree that the first phase of the validation process should be validation of the objectives by an expert in the field of study who can be objective in his outlook. Who are the experts who can make objective judgements concerning the aims, goals, or objectives of materials for deaf students in the only liberal arts college for the deaf in the world? How to establish the validity of objectives of materials for our students is a topic worthy of study. The topic is germane to most grant proposals as well as to instructional materials development at Gallaudet.

During the validation process results of pre-tests, post-tests, questionnaires, interviews, and any other instrument used to assess the accomplishments of the materials are analyzed statistically to obtain

measures of reliability and validity. Individual responses are also analyzed to determine where the materials have failed. We hear comments concerning the ineffectiveness of some types of questions for our students, but to date we have no hard data on which to base any statements, pro or con, concerning types of questions of types of tests for Gallaudet students.

Some other questions which could be investigated are:

1. How is the validity of class tests for grading purposes established? How valid are the tests?
2. Is one kind of question or test as effective for testing certain students as another?
3. Under what circumstances is one kind of test as effective as another?
4. In interviews, is manual English as effective as Ameslan in eliciting a response?
5. What media or media mix effect desired outcomes under what circumstances? For which students?
6. How much time is required by what kinds of students to attain specific objectives in a specific course?
7. Can deaf students use self-instructional materials effectively?
8. Is a specific type of classroom or classroom arrangement as valid as another for eliciting from deaf students certain responses to materials or media?

The above only sample the kinds of questions which we can begin to investigate once we have begun to validate materials, and to collect and use the data obtained in the validation process.

Closely related to validation/evaluation is the concept of cost-effectiveness, and, of course, all are integral parts of accountability. One of the goals of educational technology, which applies a systems approach to educational problem solving, is to promote the greatest amount of learning in the most efficient and effective way for the least amount of dollars. This is not synonymous with doing something in the cheapest (that is, for the least number of dollars) way possible. What this usually means is making an attempt to minimize dollar costs for any specified outcome, or, conversely, to maximize benefits for a given cost. To do this requires a study of alternatives before making a decision about developing materials.

Generally, people think that cost/benefits analysis consists of studying the cost of a program which is under consideration and of comparing the accomplishments (benefits) of students who receive the program. Then, a decision is made. However, there has been a study of only one program. In a cost/benefits analysis, after the objectives have been specified, several ways of implementing the objectives would be studied as to benefits and costs. Each would be evaluated according to preestablished criteria, and in light of the evaluation results, a decision to adopt a program or to study further would be made.

As the implementation or materials development proceeds, all costs including media purchase or rental, operation and maintenance costs, and materials development (both print and non-print) costs must be carefully monitored. These costs would be weighted against the effectiveness of the course and the materials used. The cost/benefits or cost-effectiveness study would need to be continued over a period of years (3-5 or more) so that benefits such as increased time for teachers to work with individual students, could become apparent.

To our knowledge no cost/benefits or cost-effectiveness analyses have been made for any of the materials development projects undertaken here at Gallaudet. The competition for materials development support is becoming keener. What programs should be supported? What kinds of development efforts pay off in terms of student learning and cost? Cost-effectiveness studies of projects could provide some basis for answering these questions as well as others.

Administrators are continually asked to justify budgets and courses. Cost-effectiveness analyses can supply justifications, if they are there.

What are appropriate cost/benefits analysis models for Gallaudet College is another question for investigation. In carrying out cost/benefits studies, the answer to that question would be discovered.

However, the main thrust of this discussion is that cost/benefits, or cost-effectiveness analysis, is an essential task of instructional materials development.

Conclusion

Heretofore, materials development has been of what may be called a post hoc nature. Typically, an instructor has experienced specific difficulties utilizing available instructional materials or media and, on the basis of that experience, designed substitute materials through essentially a trial and error method to meet narrow and specific usage criteria. Additionally, each materials development project has been done virtually in isolation from others, common problems such as language difficulties, matching characteristics of media or materials to deaf learners, or student motivation notwithstanding. Hunch, intuition, individual creativity and ingenuity, and luck have combined to contribute to whatever success has been enjoyed with developing sets of materials. These are critically important to any materials development project. But, by utilizing on-going materials development projects as a source of data, and using that data as a set of developing practical guidelines, the materials development effort can gradually rest on a slightly firmer foundation.

AN EDUCATIONAL TECHNOLOGY ADAPTATION OF TWO APPROACHES TO THE STUDY OF ENGLISH LANGUAGE STRUCTURE FOR USE IN THE WRITING OF A SCIENCE TEXTBOOK FOR DEAF COLLEGE STUDENTS

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I. Introduction: Why Write Another Textbook?

A science teacher at Gallaudet College must teach English also. Signed classes are not enough if we truly want our students to be teacher independent. Students must simply learn how to understand information received from the printed word. Because of alleged language and experiential deprivation of many of the first-year Gallaudet students, commercial textbooks alone (in the authors' opinion) have not significantly contributed to the preceding goal. Senior high school or beginning college books inevitably are written on a level beyond these students' abilities. On the other hand, grade school texts tend to be conceptually simplified. Junior high school books would seem to be ideal, but (for reasons shown later) the students have a difficult, and often frustrating, time reading them. One approach to overcome this dilemma would be to write a science text at the reading level of the average incoming student. Further, the reading level could increase in difficulty as the student's abilities to comprehend English language increased. Such an attempt was made in the summer of 1975 ("Prep Science" by Burkhart).[1] Section II, and following, is a history of the development and usage of the text.

II. The Technical Aspects of Writing for Preps

1. Language: A Prerequisite for Reading

The printed page is essentially a written language. If we expect a student to gain meaning from a printed page, then, we are expecting that student to be able to understand the language which the printed page represents. We are not aware of any written form of ASL, therefore, written language to the authors means written English. Even though deaf students may communicate most often and most fluently through ASL, when they read, they read English.

Therefore we believe that, since educators of the deaf are using and will most likely continue to use the print media consistently, we as educators of the deaf must determine the operational English language level of our students. With materials written on this operational level, language would no longer be the overriding factor determining the effectiveness of printed educational materials for the deaf.

2. Must Language Level Dictate the Concepts That Can Be Taught?

The authors are convinced that "high" level concepts can be taught using lower level language structures which we will refer to as Operational Language Level I through the rest of this paper. Using Operational Language Level I, the student's ability to learn higher level concepts would not suffer because of their inability to crack the code through which these concepts are often communicated. Plainly, we do not believe the complexity of the language must necessarily increase as the concept becomes more complex. We would propose that it is quite possible to vary the complexity of the concept while maintaining a relatively unchanged operational language level.

We do, however, see technical vocabulary as that aspect of language having the greatest correlation with complexity of concept. We believe that the additional difficulty which this new vocabulary poses can be alleviated by explaining its meaning in operational English.

3. Technique (An Ed. Tech. Adaptation of Two Approaches)

The language structures, which were decided upon to be included in Operational Language Level I, are a combination of two approaches for teaching language: transformational grammar, using Streng's Syntax, Speech, and Hearing and Dr. Virginia Heidinger as our resources; and Robert Krohn's English Sentence Structures[2] which approaches the teaching of English as a second language.

In essence what was done was to use transformational grammar to indicate the various sentence structures which were considered appropriate for Operational Level I; locate the equivalent structure in Krohn; and verify its place in Krohn's sequence as indeed applicable to our Operational Language Level I.

Shortly after putting our Level I into use in written materials, our resource person was consulted and made suggestions resulting in the following changes: inclusion of three patterns using infinitives; the use of the adverbial clause introduced by "because"; the inclusion of the adverbial clause and adverbial clause shift introduced by "when," and the exclusion of the if, then causal. All other structures already determined for Operational Language Level I were left unchanged.

The following are the structures included in Operational Language Level I:

Five Basic Sentence Patterns
in the Transformational Approach

I. $NP^1 + V_i{}^2 + (\text{adverbial})^3$

(e.g. I sleep soundly.)

II. $NP + V_t{}^4 + NP^5 + (\text{adverbial})$

(e.g. You attend classes at night.)

III. $NP + Be^6 + NP + (\text{adverbial})$

(e.g. Ed is a prep this year.)

IV. $NP + Be^7 + \text{Adjective} + (\text{adverbial})$

(e.g. He is tired in the afternoon.)

V. NP + Be + Adverb (place)

(e.g. I am in the office.)

[1]NP = Noun phrase/subject

[2]V_i = Intransitive verb

[3](adverbial) = optional adverbial word or phrase

[4]V_t = Transitive verb

[5]NP = Noun phrase/object

[6]Be also includes linking verbs become and remain, e.g. John became a doctor.

[7]Be also includes linking verbs become, remain, seem, feel, taste, appear, grow, e.g. The corn grew tall.

NOUN PHRASES

Determiner + Noun (various combinations of determiners are acceptable in Operational Language Level I.)

definite article	e.g. the girl; either girl
demonstratives	e.g. this girl; those girls
indefinite articles	e.g. a girl; any girl
ordinals	e.g. the third girl
cardinals	e.g. one girl; several girls
comparatives	e.g. the most girls
prearticles	e.g. a few of the girls
partitives	e.g. a group of girls

Adjective + Noun — e.g. beautiful girl

Noun Adjunct + Noun — e.g. cover girl

Gerund — e.g. the ending

VERBS

Tenses:

Present:	e.g. He lives in Washington, D.C.
Past:	e.g. He lived in an apartment last year
Present Progressive:*	e.g. He is living in a house now.
Future:*	e.g. He is going to move next year. He will move next year.

Modals:+ e.g. He can drive to work in 15 minutes.

He will drive home early today.

He should arrive home about 3 o'clock.

*Terms from traditional grammar
+including: may, could, would, might

Two-Word Verbs: (no particle shift)	e.g. He started up his car, but the battery didn't turn over.

4. List of transformations included in Operational Language Level I: (All sentences are transformed in one or more steps from one of the five basic sentence patterns. T/ = transformation)

	You played tennis yesterday.
T/do	You did play tennis yesterday.
T/negative	You did not play tennis yesterday.
T/contraction	You didn't play tennis yesterday.
T/yes-no	Didn't you play tennis yesterday?
T/there	There are many people on the courts on Saturdays.
	You played tennis yesterday. You won.
T/coordinating conjunction	You played tennis yesterday and you won.
T/deletion	You played tennis yesterday and won.
	You played tennis yesterday.
T/Wh-question	Who played tennis yesterday?
	What did you play yesterday?
	You gave a ride to Mary.
T/indirect object	You gave Mary a ride.
T/direct discourse	Mary said, "Harry also needs a ride."
T/indirect discourse	Mary said that Harry also needs a ride.
T/personal pronoun	Harry gave his racket to Mary.
	Harry gave his racket to her.
	He gave his racket to her.

T/indefinite pronoun	He gave his racket to someone.
T/infinitive	George wants to go to the country club again.
	George wants to play tennis.
	George is going to the country club to play tennis.
T/adverbial shift	George can drive across town in half an hour easily.
	George can easily drive across town in half an hour.
T/adverbial clause	Mary will stay home tonight because she is tired.
	Mary stays home when she is tired.
T/adverbial clause shift	When she is tired, Mary stays home.
T/possessive	Mary's apartment is quiet.
T/comparative	Mary's apartment is quieter than my apartment.
T/superlative	Mary's apartment is the quietest apartment in the building.
T/NP compliment	Mary knows that the building is the best in the city.

Guidelines for selection of vocabulary:

Use vocabulary:

1. with sign translation.
2. without exact sign translation but must make judgement on word regarding vocabulary level of students. (will be quite subjective)
3. that is unfamiliar to the students if a code is used (e.g. asterisk or dot after or above unfamiliar or difficult word) signalling the student to look up the word in the dictionary or glossary.
4. that are idioms but must make a judgement.

III. Application to the Textbook

1. Earlier Text

In the summer of 1974, a 10 volume Prep Science book was written. This text was necessary in that it paralleled 10, one hour, video tapes (where the video-tape/textbook combination was to be the nucleus of a self-paced course). This textbook was written with no real concern for the language level. In other words, a typical college student could be expected to understand the language and the sentence structures.

This textbook proved to be too difficult for the Preps to use--it often languished in the dormitories. However, it was believed that the self-paced system had merit and should be salvaged. Therefore, a modification and extension of the first text was accomplished in the summer of 1975. Along the lines outlined in section II.

2. Modifications and Extensions of Earlier Text to New Text.

The concepts taught in the earlier book were retained in whole and at their original level in the new book. Further, five new chapters (in chemistry) were added for a total of 15 chapters--equivalent to 15 weeks of instruction with one unit per week. (Five new video tapes were made to correspond to the chemistry sections.)

These extensions of the original text are not as important today, however, as are the language modifications. The real goal of all the language changes was to make the text readable for our average incoming Prep. Dependent clauses, infinitives, if-then statements, and other sentence structures mentioned earlier were absent from the text. Shorter sentences and more sentences were necessary to get across the same amount and depth of information--a very tedious but worthwhile chore.

3. Samples from Both Texts

Perhaps the easiest way to show all of this modification in practice is to look at a representative selection from both books. These selections lend themselves readily to comparison because they happen to correlate in content very well.

Earlier Prep Science Text

Of course, for someone standing on the spinning earth, it would appear like the sun is moving across the sky - taking 12 hours to complete its journey. Also, in the evening, the apparent motion of the moon and the stars is caused by the real motion of the spinning earth. You can have an identical experience by

sitting on a merry-go-round. To you it looks like the world is moving by, when, in reality, it is you that is moving.

Revised Text

When you look up at the sky, you think the sun is moving. The sun appears to take 12 hours to "move" from the east to the west. Really the sun is not moving. It is you. Also, in the evening, the stars and the moon appear to move from east to west. They are not moving at all. Here is the explanation. Imagine that you are sitting on a merry-go-round. You look at the people around you. They are standing on the ground. They are not moving. But, they appear to be moving to you. Really, you are moving. The earth is the same way. The earth is a giant merry-go-round. It is moving. You are moving with it. The stars are standing still.

It can be seen that the second paragraph is much more lengthy. It also has fewer dependent clauses, no passive verbs or infinitives not related to the subject. The sentences are shorter in length. However, the behavioral objectives of both paragraphs are the same.

IV. Preliminary Data on Effectiveness of New Prep Science Book

1. Is It Readable?

As stated in Section III-2, the real goal of all the language modifications from the original text was to make the text readable. One of the tools of educators, which has been used since the early 1960's to test (among other things) the readability of a textbook, is the Cloze test.[3] Samples from the book, with every fifth word deleted, were given at the times shown below. The percentage of exact correct words filled in is recorded. Although the interpretation of Cloze results varies, in general 45% to 65% correct answers is considered ideal. Below 30%, the book may be "frustrating." Above 75%, the book may be "too easy."[4]

Samples from Chapter 1 have been tested on two Prep student groups. The tests were given the first few days of class in semester one and semester two of academic year 1975-6.[5]

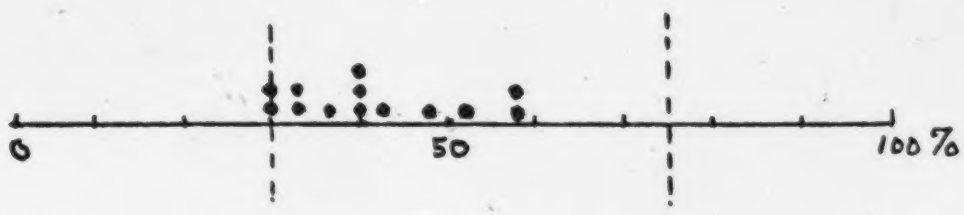
Chapter 1

The history of science starts a long time ago. It starts long before man was writing or recording history. Probably, ancient man was afraid of nature. They were afraid of things they didn't understand. Yet, they were also a little bit curious. Aren't you afraid of anything? Are you afraid of the sun? Probably not. But ancient man was afraid of the sun.

Chapter 6

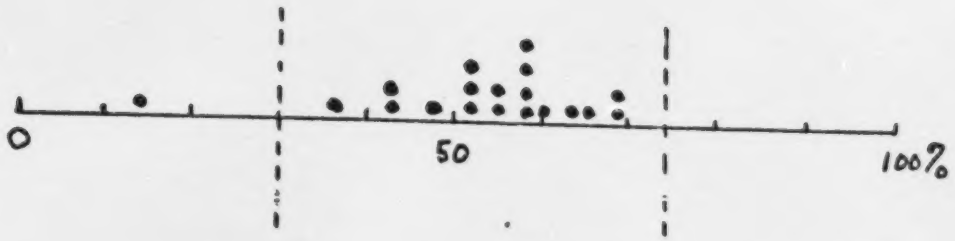
Because the lithium fuel of the ion drive is lighter, we can accelerate our rocket until we are going extremely fast. Finally, the rocket will be going close to the speed of light. It will take the passengers about three years to get to the star. But, there is a problem. To the people on earth (the people watching the rocket) the trip will take three years. But, to the people in the rocket, the trip will only take a few weeks. This difference in time is a result of the theory of relativity.

The reader will notice the inclusions of adverbial phrases, infinitives, and other "complex" structures which were outlined in section II of this paper. To determine if the students actually find the book progressively difficult, Cloze exams were given during the first week of the semester (with the selection from Chapter 15). The results are shown below.

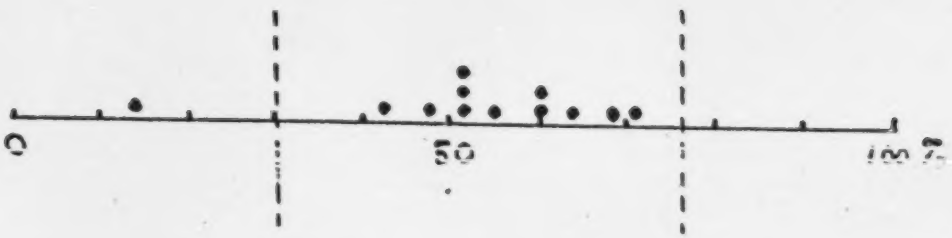


Graph #3
N = 13
$\bar{x}$ = 41%, $\hat{s}$ = 4.91
Test given:
Week 1, Semester 2, on Chapter 15

Comparing this to the same student's results on Chapter 1 (graph #2) shows a shift to the left, probably reflecting a slight increase in reading difficulty. (The additional one person was a student who missed the first



Graph #1
N = 19
$\bar{x}$ = 53%, $\hat{s}$ = 4.40
Test given:
Week 1, Semester 1, on Chapter 1



Graph #2
N = 12
$\bar{x}$ = 52.3%, $\hat{s}$ = 5.17
Test given:
Week 1, Semester 2, on Chapter 1

Since all but two student scores fall within the 30% to 75% range, we consider the book to be readable.

2. Is the Reading Level Progressive?

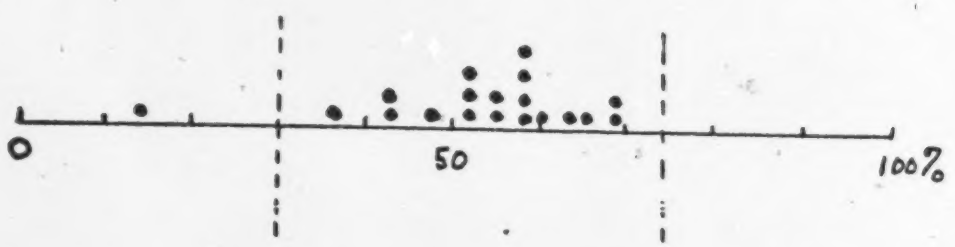
The book was designed to increase in reading difficulty during the semester. Hopefully, the students would be able to respond to a gradual increase by upgrading their skills acccrdingly. Typical examples are now given from the text:

exam but arrived in time to take the second. It is not believed that the inclusion of that score in graph #3 significantly alters these results.) Conclusion: Both the language structures and the Cloze test results show a slight increase in difficulty in the book (as planned) but the book throughout remains within the domain of "Language Level I" (as written).

3. Can the Students Cope with the Progressive Reading Level?

The only data we have here is one Cloze test given during the 12th week of semester one. (At the time of this writing, semester 2 has not yet entered its 12th week, making a semester 2 population test impossible.) The comparison of this Cloze test shows that the students are able to read Chapter 15 (during their 12th week of prep science) with the same ability they were able to read Chapter 1 (during their 1st week).

Graph #4
N = 17
$\bar{x}$ = 50.4%, s = 4.79
Test given:
Week 12, Semester 1, on Chapter 15

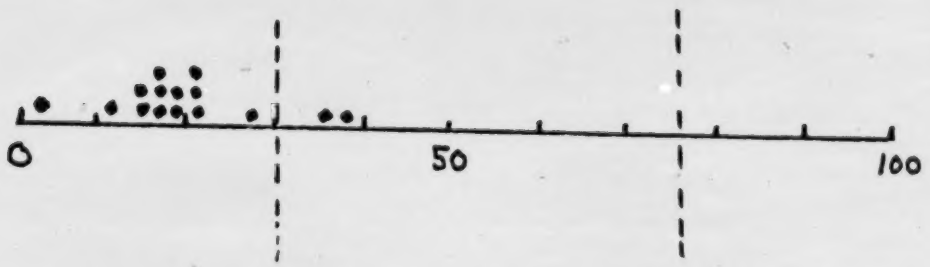


Graph #1
N = 19
$\bar{x}$ = 53%, s = 4.40
Test given:
Week 1, Semester 1, on Chapter 1

It was hoped by the authors that the students would, by reading the text regularly, gradually increase their reading skills. Although no data available support or belie this expectation, there is an indication that the students are responding positively. To see this, compare graph #1 and graph #2. The students who began this text after one semester at Gallaudet (graph #2) found this text as "readable" as did new, incoming Preps (graph #1). However, these same 2nd semester students found Chapter 15 slightly more difficult (graph #3) during their first week than did students who had used the Prep Science text for 12 weeks (graph #4). Admittedly, there are several variables which should be better controlled in future testing, but these initial Cloze results are at least not negative. Our hypothesis still is: Students who use gradually increasing language structures (as our "Language Level I") will also be gradually increasing their abilities to handle such structures.

4. Cloze Test of Another Text Used in Prep Science

In Section I, we stated that a Junior High Science Text is not suitable for adoption in Prep Science. A Cloze test given to the 2nd semester students tested in graph #2 above supports this thesis.[6] A random selection from the only other text used in the Physics portion of Prep science had this result:



Graph #5
N = 15
$\bar{x}$ = 21%, $\hat{s}$ = 4.25
Test given:
Week 1, Semester 2, random sample from text

This commercial text is expressly written for 7th grade students. By our interpretation of the Cloze results, most of the students would find this text frustrating.

5. How do the Students Feel about the Text?

Again, because of the short time the "Prep Science" book has been in print, only limited data are available. Below is a copy of the evaluations from the students. (This evaluation is on the "Prep Science" text and not the 7th grade science book mentioned above.)

Evaluation

1. I think the Prep Science book is a:

   0 a. very bad book

   6 b. average book

   12 c. very good book

2. I think that I understand this book:

   0 a. not at all, I don't understand it

   8 b. pretty well

   10 c. very well

3. I think that this book is:

   4 a. too easy

   0 b. too hard

   14 c. exactly right

4. I think that the English language in this book is:

   3 a. too easy

   0 b. too hard

   15 c. exactly right

The results are recorded next to the various choices. Briefly, it would appear that none of the students find the "Prep Science" text difficult to read or understand.

In summary, the following could be called the "objectives" of writing on a "Language Level I":

1. to have available a science text the students found readable.

2. to thereby encourage the use of the text.

3. to have available a text which incorporated a gradually increasing reading difficulty.

4. from 1, 2, and 3 above, to have a workable vehicle for increasing the students' reading ability.

The data in section IV supports the successful completion of objective 1. This data, and the evaluation, may indicate that objectives 2, 3, and 4 are within reach by this writing technique.

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3. Taylor, W.L., "'Cloze Procedure': A New Tool for Measuring Readability," Journalism Quarterly, 30 (1953) pp. 415-433.

4. Bormuth, John R., "The Cloze Readability Procedure," Elementary English, Vol. XLV (April 1968), pp. 429-436.

5. All statistics are computed from raw data, of course. $\bar{x}$ has been converted to percentages to ease comparisons of graphs.

6. Brandwein, Paul F., et al., Energy, Its Forms and Changes, Harcourt Brace Jovanovich, Inc., New York, 1972, 464 pp.

RESEARCH ON CURRICULUM MATERIALS FOR DEAF STUDENTS*

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My research work at Gallaudet College began several years ago with an interest in educational research on curriculum materials. Simply stated, the problem is how to design instructional materials for maximum educational effectiveness with deaf students.

For a number of years, educators and psychologists have been interested in the advantages of "individualized instruction," which essentially permits each student to enter an instructional program at an appropriate level and to progress through the program at a pace largely determined by the individual student. Individualized instruction also provides "instructional (or learning) objectives" which inform the student of what he is expected to learn. Most forms of individualized instruction also provide for active responding by the student to questions in the text, followed by immediate feedback or knowledge of results to reinforce comprehension and retention of new information. The characteristics of self-pacing, rehearsal, and reinforcement should be well suited to the heterogeneity typically found in deaf student populations due to individual variations in degree of hearing loss, age of onset, and deficiencies in spoken language. However, individualized instructional programs usually depend very heavily on written language which poses difficulties for deaf students who have reading deficiencies resulting from early, profound deafness. This difficulty may be partially circumvented by the use of pictorial information to convey meaning, an approach which is widely used in teaching deaf children to read.

With these considerations in mind, a colleague and I (Reynolds and Rosen, 1973) conducted a study several years ago to compare three types of (printed) instructional materials or programs, all of which presented the same information on a topic in physiological psychology: (1) A "Textbook" presentation consisting of a narrative style and relatively few pictures; (2) An "Individualized" presentation incorporating many of the features of individualized instruction described earlier; and (3) A "Pictorial" presentation in which as much information as possible was presented through pictures, with relatively less verbal description. Three groups of Gallaudet students were run in a pretest-instruction-post-test design. Two experiments were conducted. In the first, the post-test was given one day following the instructional program, while in the second, the post-test was administered after a delay of 13 days. In both

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*Paper presented at the Third All Gallaudet Symposium on the Role of Research and Educational Development Research Problems, Gallaudet College, Washington, D.C., January 21-22, 1976.

experiments, pretest performance was similar for the three groups. The post-test results, shown in Table 1, reveal that in both experiments the Pictorial format produced the best test performance, while Individualized and Textbook formats produced lower test scores.

Table 1
Median Post-test Scores
(Percent of Answers Correct)

	Instructional Format		
	Pictorial	Individualized	Textbook
Experiment 1	80%	68%	66%
Experiment 2	56%	47%	50%

The difference between Pictorial and other formats is statistically significant in Experiment 1 but not significant in Experiment 2 (although the trend favoring the Pictorial format is present in both experiments). The Individualized and Textbook formats produced similar post-test performance in both experiments. The generally lower test scores in Experiment 2, of course, reflect the 13 day delay between instruction and post-test. These results, then, provide additional support for the educational value of pictorial information in teaching concepts to deaf students. The failure to obtain any difference between Individualized and Textbook formats should not necessarily be interpreted as evidence against the use of individualized instruction since the advantages of this system may become apparent only with a more extensive program of instruction or under conditions different from those employed in this study.

The study just described employed a paper and pencil test of performance. A more recent experiment, conducted with the assistance of one of my students, examined the effects of different instructional formats on ability to follow instructions in operating and monitoring a complex control/display apparatus. The apparatus was developed by the U. S. Navy to simulate some of the control/display functions on various types of equipment operated by Navy personnel. The Navy had used this apparatus to study "job performance aids" or instructional materials varying in style and content. Following an experiment by Booher (1975), I have used this apparatus at Gallaudet to compare the effectiveness of four types of instructional materials, varying in amount of dependence on pictorial and verbal information:

(1) An "All Pictorial" format, in which all information is conveyed by pictures (line drawings) and symbols;

(2) A "High Pictorial-Low Verbal" format in which most of the information is conveyed by pictures with some ancillary verbal (printed) information;

(3) A "High Verbal-Low Pictorial" format in which most of the information is presented through verbal description with ancillary pictorial displays; and

(4) An "All Verbal" format in which all information was presented verbally with no pictorial displays at all.

Subjects were profoundly and prelingually deaf Gallaudet students who were asked to read the instructions and perform the appropriate operations on the apparatus. Subjects were assigned at random to one of four groups, corresponding to the four instructional formats. Performance was evaluated in terms of time to complete each of a number of tasks, and errors produced. The results, presented in Table 2, are for a limited subject sample (N=7 each group) and should be regarded as tentative or suggestive of a trend. Since additional subjects are presently being run in the experiment, statistical analyses of the data in Table 2 have not been performed.

Table 2

	Instructional Format			
	All Pictorial	High Pictorial Low Verbal	High Verbal Low Pictorial	All Verbal
Mean Errors Per Problem	1.50	0.86	1.52	1.09
Mean Time Per Problem (Sec.)	67	69	88	92

The results suggest that the lowest average error rate occurred for the "High Pictorial-Low Verbal" format, while the shortest average time for completion occured for the "All Pictorial" and "High Pictorial-Low Verbal" formats. Considering time and error rate together, the most effective instructional format appears to be the "High Pictorial-Low Verbal" format. These results are consistent with those of the previous study in suggesting the importance of pictorials in conveying information to deaf students. In this experiment, the relatively small amount of verbal information in the "High Pictorial-Low Verbal" format probably served to reduce ambiguity as revealed by the substantially lower error rate for this format. By comparison, the "All Pictorial" format produced rapid task completion, but a relatively high error rate implying some instructional ambiguity. The other two formats, depending more heavily on verbal information, produced both high error rates and relatively slow performance.

These two studies suggest ways in which instructional materials may be designed to produce some improvement in certain performance skills. However, producing improvement in a more general skill like reading is much more difficulty to achieve, especially in older students whose reading deficiencies have persisted over a long period of time. The reading deficiencies associated with deafness are well known, but it may be of interest to describe briefly the results of a study I conducted recently on the reading performance grade equivalent level of Gallaudet students. Samples of Prep, Sophomore, and Senior students were given the TAP Achievement Test in Reading* (10th grade level). Results showed that the mean reading score for Prep students was equivalent to about a 7th-8th grade level by comparison with hearing norms. Sophomore and Senior students achieved similar mean scores equivalent to a 9th-10th grade level. Although these results at first seem to suggest improvement in reading between Prep and Sophomore years, the effect can be largely attributed to attrition of weaker students during the first two years of college. This interpretation is supported by an analysis of college Entrance Examination scores for the three groups of students, showing that reading test scores for the current Preps were substantially lower than reading test scores for current Sophomores and Seniors at the time they applied for admission to Gallaudet.

The intractability of the reading problem is also revealed by the results of the "Experimental Preparatory Project" which was designed to improve performance of Preparatory students in English, reading, and math (Reynolds, 1974). One aspect of this project was a reading development program which involved the use of individualized instruction, captioned films, and recreational reading. A reading pretest was given at the beginning of the year and a post-test at the end of the year to the students in the Experimental Prep Project and a control group of students who were enrolled in the regular preparatory program. Results are presented in Table 3.

Table 3

		Mean Scores from the TAP Reading Test		
		Pretest	Post-Test	Diff.
Exper. Group	Mean	37.31	39.63	+2.32
	S.D.	3.87	4.44	(Sig. prev.p.)
	N.	(32)	(32)	
Control Group	Mean	39.20	40.41	+1.21
	S.D.	5.49	5.08	N.S.
	N.	(30)	(29)	

*Tests of Academic Progress, published by Houghton Mifflin Co.

The mean scores in Table 3 are standard scores for the TAP Reading Test (12th grade level), which correspond to the 7th-12th percentile for the 12th grade standardization group of hearing students. Both Experimental and Control groups showed some limited improvement in scores, although only the Experimental group showed statistically significant improvement. However, the critical comparison is between the pretest-post-test gains (improvement) of the two groups, and this comparison was not significant. Furthermore, the practical significance of the gains shown by the Experimental group is very small, representing a change from the 7th percentile (pretest) to the 11th percentile (post-test) by comparison with hearing norms (12th grade students).

The results of the first two studies suggest that pictorial information can be a very important component of instructional materials in facilitating comprehension and retention. In fact, pictorial materials are commonly used in teaching word meanings to deaf students which is effective in achieving reading performance levels comparable to those of hearing students of the same age has not yet been developed. The development of such a program is of vital importance, because virtually all other aspects of education are dependent to a large extent on reading skill. The search for curriculum materials and educational procedures which will be effective in raising the level of reading performance of deaf children at an early age is an effort which justifies a very high priority.

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A COMPARISON OF REACTION TIME AND MOVEMENT TIME IN DEAF AND HEARING FRESHMEN MALE COLLEGE STUDENTS

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The principal purpose of this study was to determine if there is a difference between deaf and hearing male freshmen college students on reaction time and movement. The students in the study consisted of 50 deaf male freshmen enrolled in the required program of physical education at Gallaudet College, Washington, D. C., and 50 hearing male freshmen enrolled in the required program of physical education at Catholic University, Washington, D. C. The students' ages ranged from 18 to 23 years; heights, from 61 to 76 inches; and weights, from 120 to 230 pounds. All subjects were in good health, and, with the exception of deafness, none suffered from any profound physical handicaps at the time of the experiment.

Two tests were administered to all the subjects. The first test was a simple reaction test requiring the subjects to depress a telegraph key with the index finger when a visual stimulus appeared. The second test required reaction speed and movement speed to a complex task requiring the extinguishing of 10 lights in random sequence. Each subject had 10 trials on each of the two tests. Both tests had standardized procedures which were communicated* to each group. After obtaining the subject's age, height, and weight, he was instructed to take the simple reaction test, which was then followed with the reaction-movement time test.

Simple Reaction Time Test

On the simple reaction time test, the subject lightly touched his index finger of the dominant hand on the middle telegraph key (numbered 2) which was 12 inches from the end of the table. The light stimulus was placed directly in front of the subject, 4 inches from the telegraph key. The tester gave the ready signal either verbally or manually to each group. A light would go on by the depressing of the master button on the reaction timer, after the foreperiod was randomized from one to four seconds. Each subject was given 10 trials. The reaction timer recorded the response in hundredths of a second.

*For Deaf subjects, the simultaneous method was used, which uses sign language, gestures, fingerspelling, and speech to convey ideas.

Reaction-Movement Time Test

On the reaction-movement time test, the students stood directly in front of a panel five feet wide and seven feet high. On this panel were twenty lights (five rows, with four lights on each row), with corresponding switch buttons immediately below each light. All subjects were instructed to stay behind a white line drawn vertically and horizontally from the center of the panel one foot away.

On the ready signal, the student raised his hands, palm facing the panel to shoulder height. Again, the initial response was randomized from one to four seconds after the ready signal was given.

When a light went on, it remained on until it was turned off by its switch. As one went off, another light came on automatically. This procedure continued until 10 of the 20 lights had been pressed off. Each trial was identical for every individual tested.

The sequence of lights was arranged by plugging banana plugs into the control board back of the panel. After each trial, it took the experimenter about 45 seconds to change the sequence before the subject could be given another trial. Each subject was given 10 trials and the average score of the 10 trials was used in the statistical analysis. An automatic timing device, which was started by the experimenter, went on instantly with the first light, and continued until the completion of the task. A registered total time accumulated was recorded in hundredths of a second.

No practice trials were given to any students, and each student was individually tested under similar conditions (quiet rooms, dark enough to see the red lights glow).

The reliability of the tests as determined by Person's product moment coefficient of correlation indicated r's of .74 and .91 for reaction and reaction-movement time, respectively, for hearing subjects, and similar r's of .69 and .81 for deaf subjects. Application of the Spearman-Brown prophecy formula to the source data gave the following correlations: .85 and .95 on reaction and reaction-movement time for hearing subjects and .82 and .89 on reaction and reaction-movement time for deaf subjects.

The results of the t-test between the means of the two groups in reaction time indicated that there was no significant difference between the two groups on a simple reaction-time test. The data showed that the deaf had a faster reaction time, .244 to the hearing groups, .250. This, however, was not significant at the .05 level of confidence with a t ratio of 1.196.

On the reaction-movement time test, the deaf group had a mean score of 10.45, as compared to the hearing group's 11.58.

The t-test showed that this difference was significant, the t ratio was 5.368, which was significant beyond the .01 level of confidence.

The results of this study indicate that the deaf and hearing groups did not differ significantly on a simple reaction test. However, on a reaction-movement time task, the deaf were found to be significantly faster than the hearing group.

The data indicated that the deaf subjects were clearly superior to the hearing in a test requiring both reaction and movement. From past experience and observation, the investigator believes that the deaf scored higher in reaction-movement time test than the hearing because of some type of peripheral visual acuity which may be possessed by the deaf. More research would have to be done to confirm this.

HEARING CHILDREN OF DEAF PARENTS

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There are no known statistics that indicate the percentage of hearing offspring who have deaf parents in the general population. In the absence of this data, educators generally agree that the number ranges between 85 and 90 percent. It is interesting to note that, while research abounds on the cognitive and communication development of deaf children of deaf parents, studies concerning evolutionary stages of growth of their hearing children are practically non-existent. A review of the literature reveals that research that has been attempted in this area has concentrated almost exclusively upon the possible speech defects that may result from a child growing up in a "deaf environment." Accordingly, in the treatment of our present study, we were left to draw upon counseling experiences, observations, and the results of an informal inventory.

Experiences of the author in counseling deaf parents and their hearing children for more than two decades have underlined concerns that repeatedly have been expressed in the form of questions: Will the parents' deafness preclude or unduly impede normal spoken and written language development of their hearing offspring, particularly in instances where the parents evidence little or no oral communication skills? Are deaf parents adequately prepared to meet the physical, psychological, and social needs of their hearing offspring? Do hearing children resent, feel defensive, or experience embarrassment because of their parents' deafness?

Well publicized incidents in recent years, whereby courts of law, social workers, and clinical psychologists have posed the same questions in one form or another in seeking to ascertain the fitness of deaf parents to adopt a hearing offspring, to provide adequately for their hearing siblings, and numerous myths that abound which adversely reflect upon the capabilities of deaf parents, inspired the purpose of this study.[1] It should be noted that no attempt was made to conduct an exhaustive investigation which the subject merits. Rather, an effort was begun to obtain objective data from hearing children that in turn hopefully would provide information to deaf parents which would satisfy their basic concerns and prove of assistance to them as they confronted the challenges presented by the developmental needs of their hearing children. It further was anticipated that results of the study would provoke attention from professionals that would lead to in-depth studies of various aspects of a subject that heretofore largely has been ignored.

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[1]This study was made while the author held the Powrie Vaux Doctor Chair of Deaf Studies at Gallaudet College, 1973-74.

METHOD AND PROCEDURE

An informal inventory was devised and administered individually to 30 selected hearing adults whose parents are deaf. Of this number, three identified their parents as having reasonably intelligible speech; seven described the articulation of their parents as "deaf speech" (understood only by persons who are familiar with their vocalization over an extended period of time); 20 indicated that their parents were functionally non-oral. The 30 subjects were all high school graduates; four had completed two years of college; 17 had obtained a bachelor's degree, with three of this number now holding a master's degree, and two others were currently enrolled in master's degree programs. The ages of the subjects varied from 28 to 37 years, with a median age of 32 years. Parents of respondents were described as "typical" deaf parents; that is, they held diplomas or vocational certificates from residential schools for the deaf, resided in medium income housing areas, and pursued vocational trades that had been chosen in schools of which they were graduates.

SUMMARY OF FINDINGS

The language of signs was the first language developed by hearing children in their infant stage of development. Respondents indicated that manual communication provided a symbol system which contributed positively in vocabulary development and in oral and written communication. They spoke and wrote in longer sentences, had few errors in spelling, but were somewhat below the norm of first graders in vocabulary. This deficiency was overcome following two years of formal schooling. The "silence" of the home was adequately compensated by interaction with relatives and peers who possessed normal hearing. None of the respondents indicated speech defects which required speech therapy. It would appear, therefore, that speech and language development of hearing children of deaf parents is not impeded by the home environment.

Social development of respondents in their formative years centered basically around activities planned for deaf persons. Deaf parents are inclined to include their children in social and religious activities of the deaf community during the first 12 years of life. Except for friendships within their immediate neighborhood, deaf parents tend to shy away from the social involvement of their hearing children with persons of normal hearing. They further are reported to develop strict guidelines for the social life of their hearing children and at times become unduly suspicious of the child's associates and social activities in which he participates. The literal manner in which deaf parents frequently view and interpret social situations gave rise to misunderstandings and unnecessary conflicts. Deaf parents tend to be sensitive to the child's grooming and appearance, and this was viewed as a positive contribution by their children.

Respondents indicate that deaf parents exert a profound influence upon their choice of vocation. Parents tend to encourage the child to prepare for a profession that serves the needs of deaf persons. A review of the number of hearing adults engaged in professions, organizations, and agencies that provide services to deaf people appears to bear out this influence. Deaf parents take considerable natural pride in the achievements and contributions of their hearing children. An unusually large number of respondents reported interest in music and the ability to play musical instruments. While deaf parents were unable to share this interest, they encouraged its development and provided necessary musical equipment. It further was noted that a majority of manual interpreters are hearing offspring of deaf parents.

In reaction to the concern of parents relative to the hearing child's acceptance of their deafness and its implications for their wholesome development and life adjustment, respondents were unanimous in expressions of acceptance, affection, and gratitude to their parents. They noted that parents on the whole do an effective job in raising their hearing children. They demonstrate genuine interest and concern for their early education, development of normal communication skills, and are inclined to sacrifice their own needs in order to make post-secondary education possible for their hearing children. Reservations expressed were, in the judgment of respondents, by-products of deafness and of such a sensitive nature that the children were unable to cope with. These problems were described as "sources of irritation" and may be summed up as follows:

> The hearing child considers a telephone imperative to communicate with hearing peers. The deaf parent, on the other hand, views the telephone as a means through which he can communicate his needs through his hearing child.
>
> Demands by deaf parents for constant manual interpreting by the hearing child, not infrequently involving disputes with hearing individuals, tend to convey to the child a feeling of servitude. He wonders at times whether he is being loved or used.
>
> The hearing child is at loss as to how he can be corrective of mannerisms of his deaf parents--noises, burping, heavy breathing--that are irritating to him and persons who hear.
>
> In families where there is a deaf child, the hearing child feels that the former is the major focus of attention by his parents, he is expected to assume the role of an assistant parent in guidance of the deaf child, and inner resentment ensues.

> The hearing child frequently feels that the mores of his parents are out-dated and outmodeled -- they appear resistant to change -- but he is uncertain how to reconcile their views with present social expectations.
>
> The literal or concrete manner in which many deaf parents are reported to think is often difficult for hearing children to understand. This single attribute is regarded as the most common cause of unnecessary misunderstandings, conflicts, and unhappiness.

The above concerns notwithstanding, respondents maintain that deaf parents are wholly capable of the successful development of children who hear. The major psychological needs of all children -- acceptance, love, and discipline -- are adequately provided by deaf parents. It further was noted that deaf parents refrain from interfering in the internal married life of their hearing children, while at the same time they willingly respond to needs requested of them and evidence natural pride, attention, and affection for their grandchildren.